EXECUTIVE
MODEL 100D
OPERATION and MAINTENANCE
MANUAL

International
CRYSTAL MFG. CO., Inc.
OKLAHOMA CITY, OKLAHOMA

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MANUAL

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INTERNATIONAL
Crystal Mfg. Co., Inc.
18 N. Lee
Oklahoma City, Oklahoma

VOLUME
SQUELCH
OFF
TUNE
2
3
RECEIVE SELECTOR
CHANNEL
6
9
13
1
22
TRANSMIT SELECTOR
9
MICROPHONE
OPERATE
CALIBRATE
Executive
INTERNATIONAL CRYSTAL MFG.

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SECTION I

GENERAL

The INTERNATIONAL EXECUTIVE, Model 100-D is the latest of the Executive series. This Citizens Band unit combines a sensitive and selective dual conversion receiver with a highly stable and efficient crystal controlled transmitter. The complete transmitter, receiver and power supply are housed in an attractive brown cabinet to blend favorably in the home, office, car or truck.

The EXECUTIVE Model 100-D makes use of a high-frequency crystal filter. Use of this filter between the first and second mixers greatly reduces adjacent channel interference.

The new delayed AVC system enables the receiver to handle very high input signal levels without overload.

The receiver manually tunes all 23 Class "D" Citizens Band channels. In addition two receiving crystal sockets are provided in the unit for the selection of any two desired channels. The selection of either crystal controlled channel, or manual tuning is accomplished with a three position switch on the front panel. A squelch circuit is built-in to provide receiver quieting during periods when no signal is being received.

The transmitter oscillator uses fundamental crystals operating at one-half the desired operating frequency. The crystals supplied have a frequency tolerance of .005% when used in the EXECUTIVE. A twelve position crystal switch assembly allows the operator to choose anyone of twelve channels at the flick of a switch.

The illuminated TRANSMIT SELECTOR allows the operator to instantly select the desired channel for which crystals have been installed in the selector switch assembly. Illuminated from behind the panel, the transluscent channel buttons in the switch dial assembly make channel switching easy even in the darkest mobile installation.

A new speech clipper-filter circuit utilizing an audio bandpass filter and 6DS4 nuvistor has been incorporated in the Model 100-D. This new circuit allows the operator to maintain a higher average level of modulation without exceeding the 100% limit.

The EXECUTIVE has been designed with flexibility of installation in mind. It may be used in the home or office with power secured from the AC line. It may also be used in a car, boat, plane or other mobile and portable applications, wherever there is 6 or 12 VDC available. It may be used with a base loaded whip antenna, regular whip, long wire, ground plane, beam and other types of antennas. The attractive case design lends itself to use in the home or office without appearing unsightly or out of place.

Though the unit is very versatile, it is not to be expected that either receiving or transmitting results will be the same in every installation. As in all radio communications and particularly in VHF applications, the type of antenna, its location above ground, the noise present in the area and other factors are bound to affect the results obtained.

SPECIFICATIONS

Receiver:

Tuning Range (Manual tuning)	26.955 to 27.265 mc (Class "D" Citizens Band, Channels 1 through 23).
Tuning Range (Selector Pos. 2)	Crystal Controlled - Any Channel, 1 through 23.
Tuning Range (Selector Pos. 3)	Crystal Controlled - Any Channel, 1 through 23.
Sensitivity	Usable to .1 microvolts
Selectivity	50 db down at 10 kc better than 60 db down at 20 kc
Image Rejection	Better than 50 db down
Audio Output	2.5 watts into 4-6 ohms
Speaker Impedance	4-6 ohms
Squelch Range	.5 to 20,000 microvolts. On-off differential is approximately 1 microvolt, at 5 microvolt input.
Noise Limiter	Automatic, series-gate

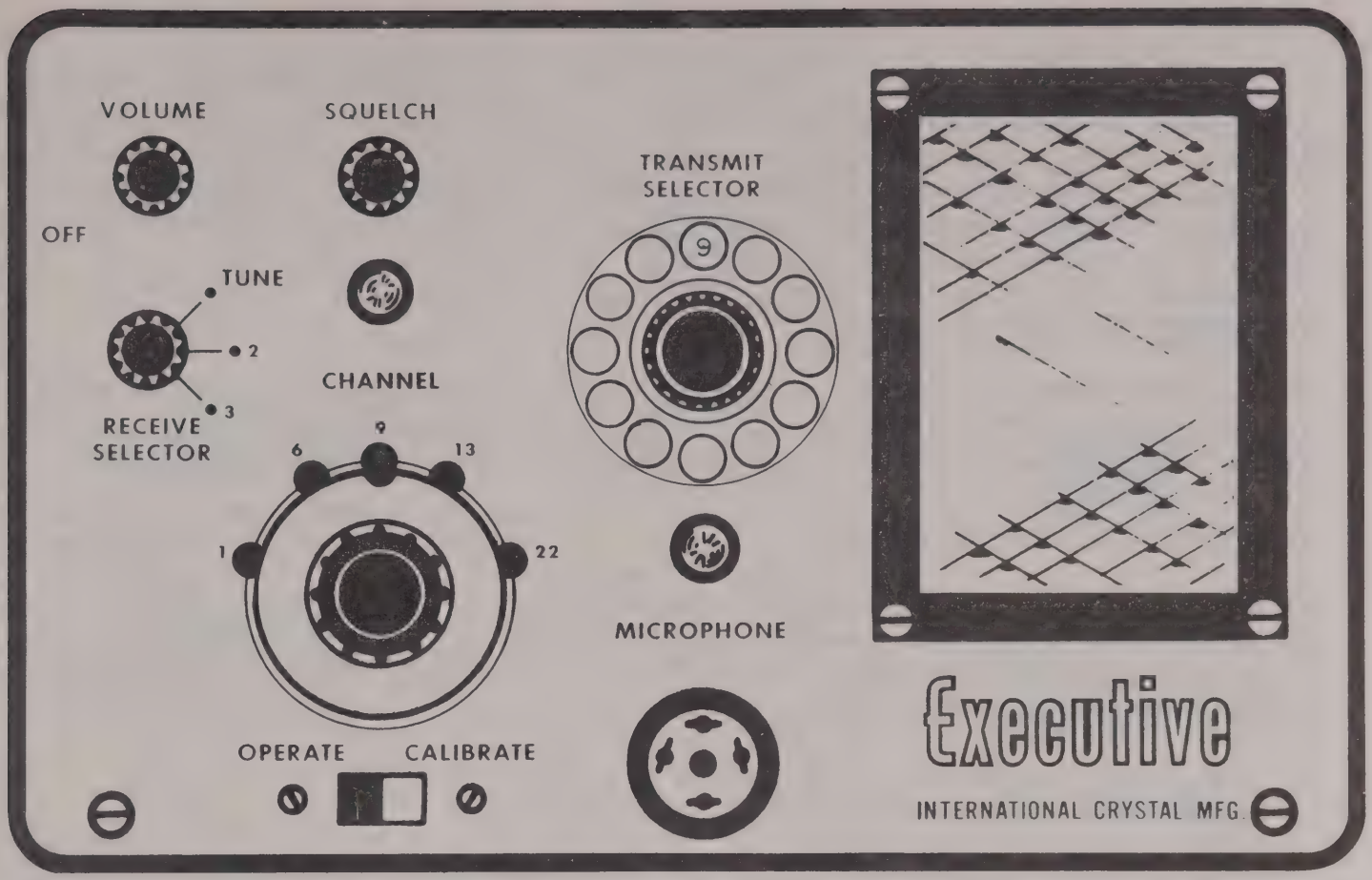
TRANSMITTER

Frequency Stability	$\pm$ .005% @ O° to 125° F, when used with INTERNATIONAL high stability fundamental crystals.
RF Power Input	5 watts maximum (FCC rules)

Modulation	Capability - 100% with built in modulation limiter.
Crystals Required	Transmitter - INTERNATIONAL "T" (T-9 for Channel 9, etc.), high stability, fundamental type, at one-half the desired frequency. Receiver INTERNATIONAL "R" (R-9 for Channel 9, etc.)
Microphone	High impedance crystals, ceramic or high output dynamic type. (Push-to-talk switch required.)

POWER CONSUMPTION

Transmitting	65 watts (approximate)
Receiving	60 watts (approximate)
Weight	12 pounds (approximate)



FRONT PANEL CONTROLS

VOLUME

On-off switch, volume control. To turn receiver on, turn the knob clockwise. Clockwise rotation of the knob also increases the volume level. Allow the set to warm up for about one minute before you wish to use it.

SQUELCH

This control is used to eliminate background noise when no signal is being received. Upon initial warmup, turn this control fully counter clockwise until a click is heard. The switch in the squelch control is OFF in this position. To operate, turn squelch control on and fully clockwise. Then slowly turn the control counterclockwise until the background noise just disappears. Leave the control set at this point. Do not turn the control too far counterclockwise as this will reduce the receiver performance and weak signals will not be heard.

RECEIVE SELECTOR

Set this control to TUNE unless receiver crystals have been installed in positions #2 and #3, in which case set the switch to the desired crystal position for crystal controlled reception.

TRANSMIT SELECTOR

A channel 9 crystal has been installed at the factory in switch position #2. A channel 9 indicator button has been installed in the indicator dial assembly. Channel number indicator buttons are furnished with each INTERNATIONAL transmit crystal and may be installed in the desired position of the indicator dial assembly. Place the switch in this position unless you have had other crystals installed, in which case select the channel on which you desire to transmit.

CHANNEL (Tuning)

With the RECEIVE SELECTOR set in TUNE position this control tunes the receiver through the range of all 23 channels. The approximate locations of channels 1, 6, 9, 13 and 22 are indicated on the panel. Other channels fall in between these points.

OPERATE-CALIBRATE (Switch)

During normal operation this switch is left in the OPERATE position. When it is desired to pretune the receiver to a specific channel (you must have a transmit crystal for this channel installed in the TRANSMIT SELECTOR crystal socket) set the controls as follows:

TRANSMIT SELECTOR to the desired channel
OPERATE-CALIBRATE switch to CALIBRATE
RECEIVE SELECTOR to Tune
Rotate tuning dial until the loudest part of the tone signal is received.
Rock the tuning dial back and forth to locate the center of the signal.
Leave tuning dial at this point and the receiver is pretuned to transmit channel you have selected. Return OPERATE-CALIBRATE switch to operate position.

MICROPHONE (Receptacle)

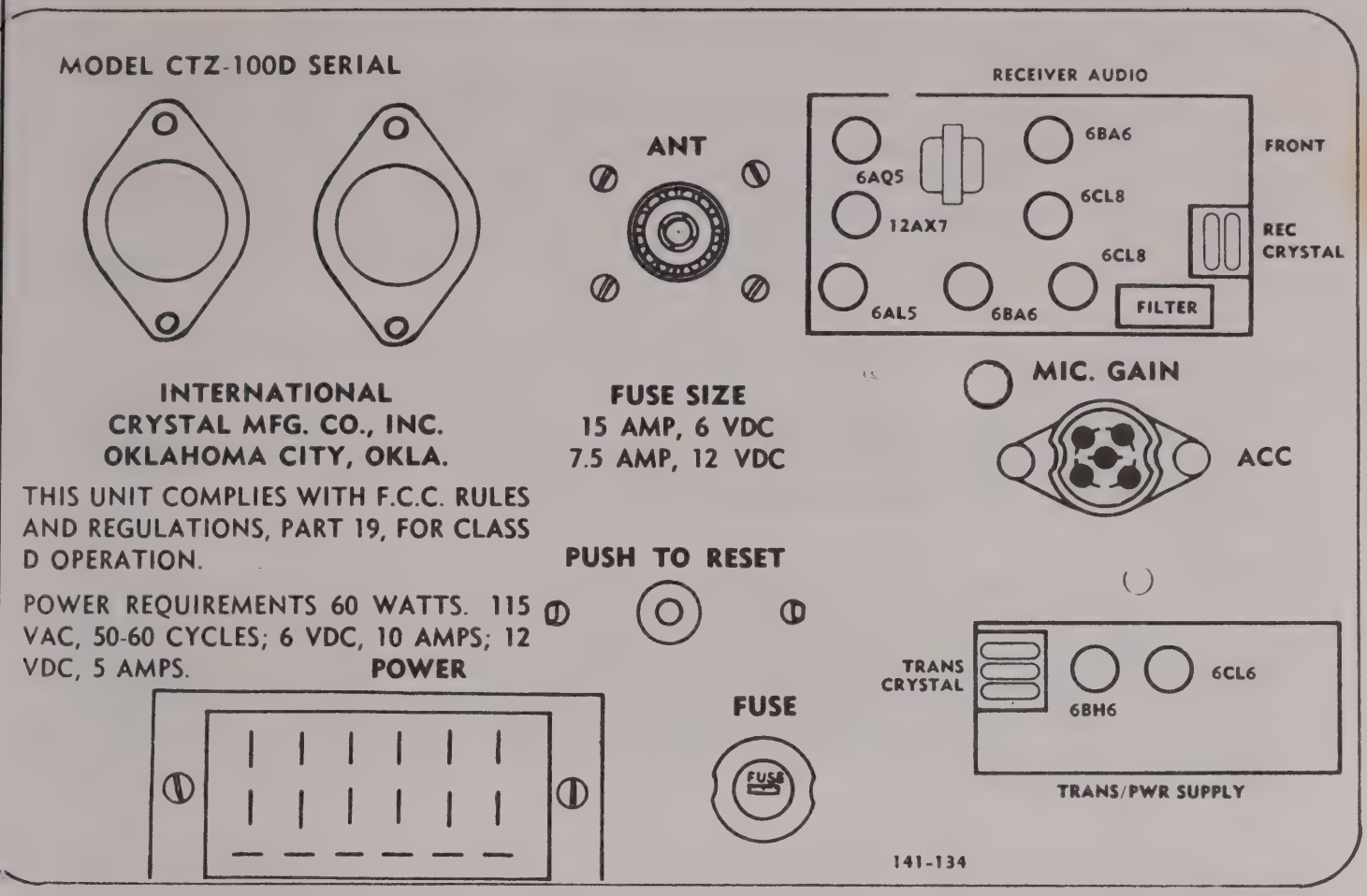
This connector requires a four prong lock-on plug which is furnished with the unit. High impedance crystal or ceramic type microphones may be used with this transceiver.

RECEIVE (Indicator)

This indicator located directly below the squelch control, functions as an ON-OFF (plate voltage) indicator for the receiver section of the transceiver. When the transceiver is operating in RECEIVE position, the lamp will glow steadily and go out when the transceiver is placed in TRANSMIT position.

TRANSMIT (Indicator)

This indicator functions as an audio level monitor. Depress the microphone keying button and speak directly into microphone. The indicator light will flicker intermittently as you speak in a normal voice level. With indicator operating on voice peaks, modulation will be about 95%. When talking too close to microphone the indicator lamp will glow almost constantly. This can result in over-modulation and cause adjacent channel interference. This indicator will flicker when the transceiver is in RECEIVE position also, showing proper operation of the receiver audio section.



REAR PANEL CONTROLS

ANT (Antenna Receptacle)

This receptacle is used to connect the transmission line to the transmit-receive relay, TR-1. The receptacle is a standard low-loss, VHF type designed for 50- to 72- ohm coaxial cable.

ACC (Accessory Receptacle)

This connector requires a five prong plug which is furnished with the unit. This plug contains a jumper for internal speaker operation and must be in place for the set to function. An external speaker and Signal Strength ("S") Meter may be connected to the set with this connector.

FUSE

A 15 ampere fuse is installed in the fuseholder and may be changed or replaced, if necessary, by unscrewing the red insert in the center of the holder. If the transceiver is to be operated on 12 volts dc the fuse should be replaced with one having a rating of 7.5 amperes.

MIC. GAIN (Microphone Level)

This control adjusts microphone amplifier gain. The level has been set at the factory in conjunction with the speech clipper level control to maintain close to 100% modulation with a wide variation of input signal level from the microphone. In view of this, adjustment of this control will not normally be required. The red transmit indicator lamp will begin to flicker on voice peaks indicating approximately 95% modulation. CAUTION: Excessive gain will cause overmodulation.

PUSH TO RESET

This is a thermal cut-out. It protects the unit when it is being operated on 115 volts ac. If overload causes it to cut out, it can be reset by pressing in on the plunger and holding it in for about two seconds.

POWER

An 18-contact plug is used as a power connector. This allows various input voltages to be used without requiring changes within the unit. All necessary connection changes are made on the external plug. Five different cord assemblies are used; 115 VAC, 6 VDC negative ground, 6 VDC positive ground, 12 VDC negative ground, and 12 VDC positive ground.

SECTION II

RECEIVER CIRCUIT DESCRIPTION

The receiver section of this transceiver is a double conversion unit employing the superheterodyne principle of frequency conversion. The first converter is composed of three basic sections; an rf amplifier, mixer, and oscillator which is either tunable or crystal controlled.

A received signal from the antenna is coupled to the control grid of the rf amplifier through a double tuned circuit consisting of coils L1 and L2, their respective shunting capacitors, and coupling capacitor C3. This double tuned circuit aids greatly in the elimination of unwanted signals outside the passband to which it has been tuned. The gain of the rf amplifier is controlled automatically by the receiver's delayed AVC system coupled to the control grid of V1 through a 1 megohm resistor.

After reaching the control grid of V1 (6BA6) the signal is amplified and coupled to the control grid of the mixer, V2A (triode section of 6CL8A). Here the signal is heterodyned with a signal in the 17 mc region coupled from the oscillator, V2B (tetrode section of 6CL8A). A difference frequency signal at 10 mc is selected by coil L6 in the plate circuit of the mixer, V2A and coupled to the grid of the second mixer in the I. F. strip through the 10 mc crystal filter-amplifier assembly.

The oscillator is a conventional Colpitts circuit which may be either crystal controlled or tuned over a limited frequency range when the RECEIVE SELECTOR switch is in TUNE position.

The second section of the receiver consists of a mixer and crystal controlled oscillator, intermediate frequency amplifier, second detector and noise limiter, a special squelch circuit, and delayed AVC system.

The 10 mc signal received at the grid of the second mixer, V3A, is heterodyned with a 10455 kc signal from the crystal controlled oscillator, V3B. The difference frequency of 455 kc is selected in the plate circuit of V3A and transformer coupled to the control grid of the intermediate frequency amplifier, V4. The gain of this amplifier is also automatically controlled by the AVC system connected to the grid of V4 through the secondary of transformer T1 and 220 K ohm resistor.

The signal is further amplified in V4 and coupled from the plate through transformer T2 to the plate of the detector, V5A, where the audio component is detected. V5A is also used to produce the normal AVC voltage for receiver I. F. section. The AVC voltage for V1 the rf amplifier is obtained from the delayed AVC system. This circuit is assembled on a small terminal board and mounted as a subassembly on the bottom side of the I. F. board. With no signal input to the receiver the voltage at pin #7 on the converter board is from .2 to .5 volts positive. This voltage is prevented from going further positive by clamping diode CR-1. As the level of the 455 kc signal from the plate of I. F. amplifier V4 increases the voltage applied to the control grid of V-1 gradually becomes more and more negative. When the input signal received by the antenna reaches approximately 5 microvolts, V1 is cut off as the negative voltage

being applied to the control grid is about -20 volts. The detected signal is coupled to V5B which acts as a series-type noise limiter removing noise pulses which may ride through on the signal. The squelch circuit consisting of a neon lamp, NE-1, silicon diode, CR-4, and associated components is connected so that the audio section of the receiver is cut off and background noise eliminated when no signal is being received. The cut-off level may be varied by use of the squelch control.

The third section of the receiver is a conventional audio amplifier consiting of a twin triode audio voltage amplifier, 12AX7, V6A-V6B followed by a 6AQ5, V7 tetrode power amplifier. When the transceiver is in RECEIVE position only one-half of the 12AX7 is used. The second triode section, V6B, receives the audio signal from the center tap of the volume control. The audio signal is amplified in V6B whose output is RC coupled to the control grid of the power amplifier, V7, through a bandpass circuit consisting of choke L13 and capacitors C70 & C75. The audio signal is further amplified in V7. The plate of V7 is connected to transformer T-3, which performs a dual function. In RECEIVE position this transformer acts as a normal output transformer with its secondary connected to the speaker. In TRANSMIT position, its function is that of a modulation transformer.

In TRANSMIT position, V6A is utilized as a straight voltage amplifier. This stage is preceeded by a level clipping circuit consisting of a 6DS4, V10, diodes CR5 & CR6 and associated components. This clipping circuit allows a higher average level of modulation without the danger of exceeding the 100% limit.

TRANSMITTER CIRCUIT DESCRIPTION

The transmitter is a two-stage unit consisting of a crystal controlled oscillator and neutralized tetrode final amplifier. The crystal oscillator is an electron-coupled Colpitts circuit with the crystal oscillating in the grid cathode circuit. The oscillator uses INTERNATIONAL high stability, fundamental type crystals operating at one-half the desired transmitter output frequency. A twelve position switch, TRANSMIT SELECTOR, is provided to select any one of twelve crystals, which may be installed within the unit. A channel 9 crystal is furnished with the unit and installed in one of the twelve crystal sockets.

The plate circuit of the oscillator is tuned to the second harmonic of the crystal frequency by coil L19. The oscillator output is inductively coupled to the grid coil L17 of final amplifier, V9. The plate circuit of V9 is a shunt-fed, pi matching network. Neutralization is accomplished by capacitor C85, and link coil L16, coupled to the cold end of coil L17.

POWER SUPPLY CIRCUIT DESCRIPTION

A three-way supply is used in this transceiver. It operates as a conventional, full-wave rectifier circuit on all voltage inputs followed by a capacitor input RC filter network. On 6 or 12 volt battery operation, a transistor oscillator circuit is used to provide the necessary AC voltage for the primary circuit of the power transformer.

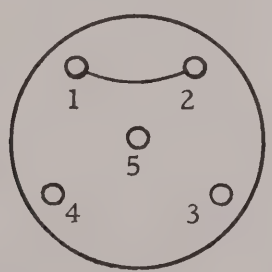
The transceiver is supplied with a power cord for operation from 115 volts AC, 60 cycles. The unit may be operated either from 6 volt positive ground, 6 volt negative ground, 12 volt positive ground, or 12 volt negative ground by use of the proper power cord assembly which may be purchased from your dealer. The power supply is equipped with a thermal circuit breaker for protection on AC operation. For protection on 12 volt DC operation a 7.5 ampere fuse is used with the transceiver. Protection on 6 volt DC operation is provided by a 15 ampere fuse which is supplied with the unit. When 12 volt DC operation is desired the 7.5 ampere fuse must be substituted for the 15 ampere fuse.

ACCESSORY RECEPTACLE

This connector, located on the rear panel of the unit, requires a five prong plug which is furnished with the unit. This plug contains a jumper for internal speaker operation and must be in place for the set to function. For external speaker (4 to 6 ohms) operation, remove the jumper and connect the external speaker between terminals 1 and 5 of the plug.

Also available at terminal #3 of this connector is the negative AVC voltage produced by the second detector of the I.F. unit. This voltage may be used to operate an "S" Meter provided the input impedance of the external meter is one megohm or more.

ACCESSORY PLUG WIRING



1 } Jumper
2

3 -AVC Voltage

4 12 VAC

5 Ground

WIRING POWER PLUG FOR MODEL 100 D

The 3-way power supply may be operated from any one of 5 different power systems; 115 VAC; 6 VDC positive ground, 6 VDC negative ground, 12 VDC positive ground, 12 VDC negative ground. Depending upon voltage to be used, connect the jumper wires to the plug as indicated below. A power cord is included with the kit. If it is desired to connect the plug for battery use, two pieces of #12 or larger battery wire, no longer than three feet, should be used between the plug and battery. DO NOT USE SMALL SIZE WIRE OR LONGER LENGTHS WHEN OPERATING FROM BATTERY AS THIS CAUSES EXCESSIVE VOLTAGE LOSS.

Remove the cover from the power plug by removing the two retainer pins and then separating cover and base. The sketches below are of the connection side of the plug base. Use the #18 buss wire supplied to make jumpers. Where jumpers cross and there is danger of a short, use a length of the insulating sleeving over the wire.

Part #150-174
115 VAC
115 VAC to pins 1 and 4
Jumper pins 2 and 3
Jumper pins 13 and 18

Part # 150-212
6 VDC Neg. Gnd.

+6 VDC Hot to pin 1 red
-6 VDC Gnd. to pin 15 brown
Jumper pins 11 to 12 to 14 to 15 to 18
Jumper pins 2 to 5 to 17
Jumper pins 7 to 8
Jumper pins 6 to 9
Jumper pins 10 to 16

Part #150-213
6 VDC Pos. Gnd.

-6 VDC Hot to pin 1 brown
+6 VDC Gnd. to pin 15 red
Jumper pins 9 to 12 to 15 to 18
Jumper pins 6 to 11 to 14
Jumper pins 2 to 5 to 17
Jumper pins 7 to 8
Jumper pins 10 to 16

Part # 150-214
12 VDC Neg. Gnd.

+12 VDC Hot to pin 1 red
-12 VDC Gnd. to pin 15 brown
Jumper pins 10 to 14 to 15
Jumper pins 7 to 8 to 16
Jumper pins 2 to 5 to 18
Jumper pins 6 to 9

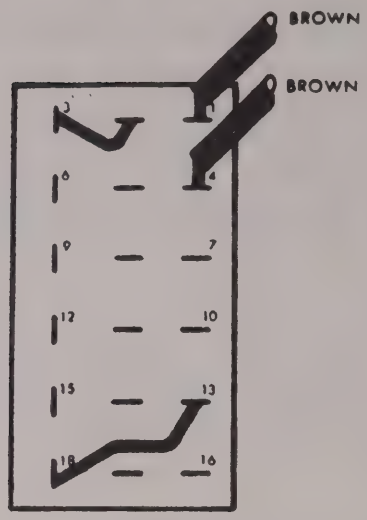
Part #150-215
12 VDC Pos. Gnd.

-12 VDC Hot to pin 1 brown
+12 VDC Gnd. to pin 15 red
Jumper pins 6 to 10 to 14
Jumper pins 7 to 8 to 16
Jumper pins 2 to 5 to 18
Jumper pins 9 to 15

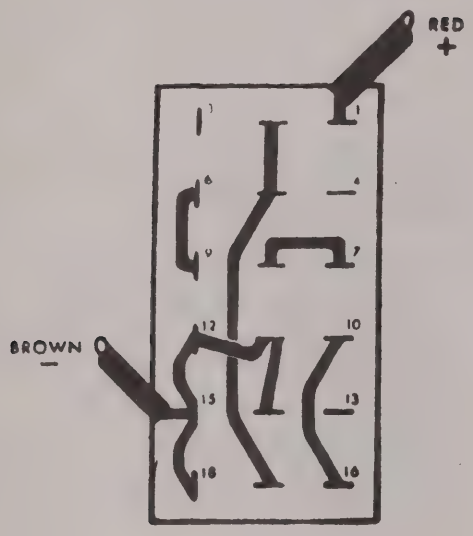
POWER PLUG WIRING

(ALL VIEWS FROM BACK OF PLUG)

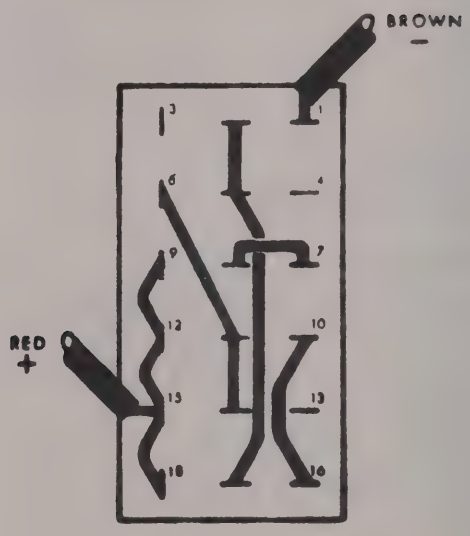
115 VAC 150-174



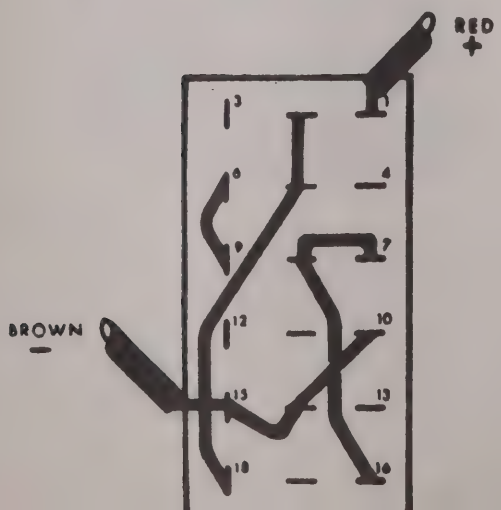
6 VDC Neg Gnd 150-212



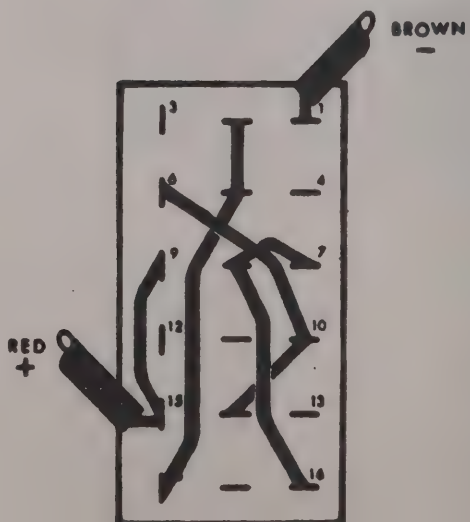
6 VDC Pos Gnd 150-213

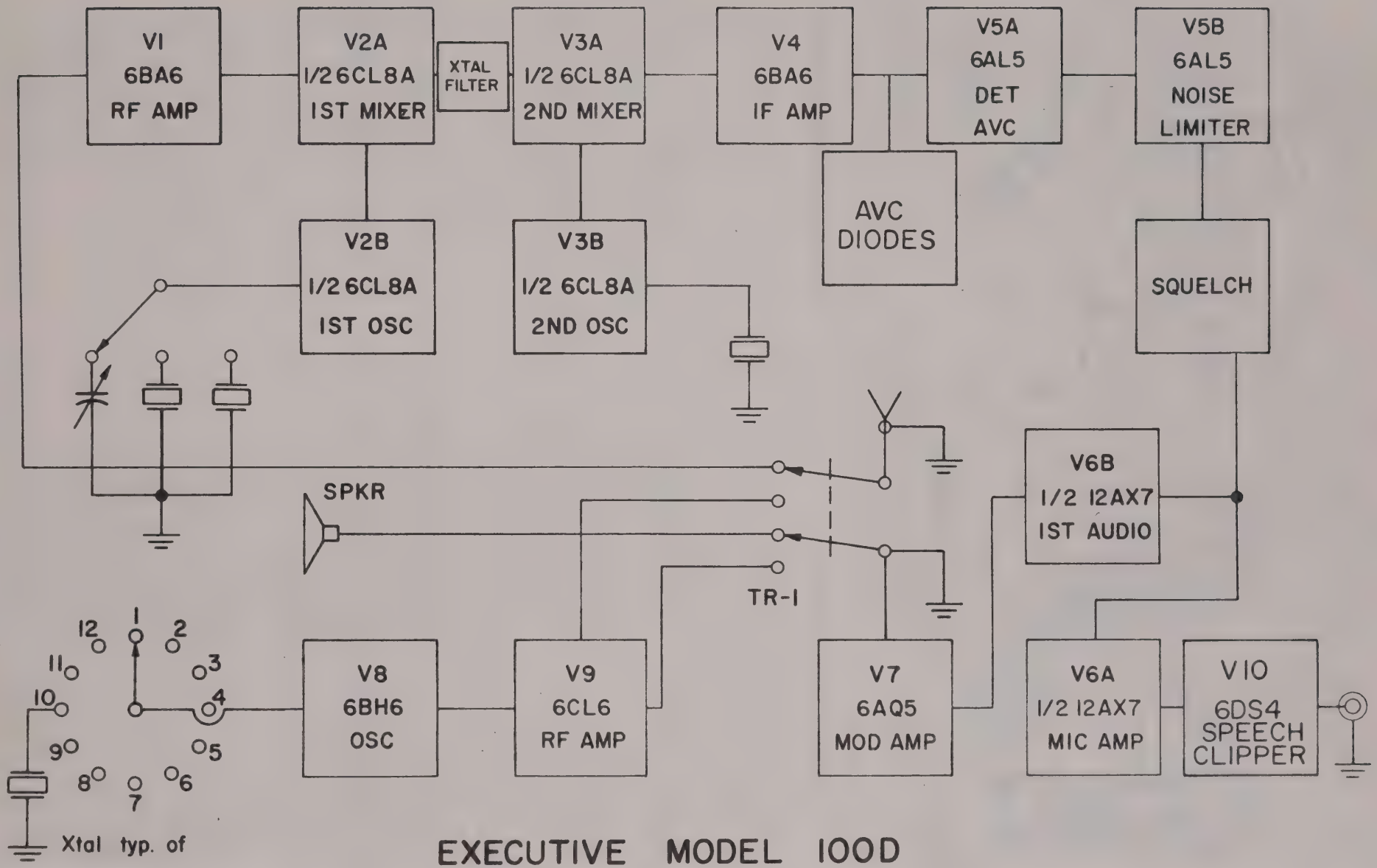


12 VDC Neg Gnd 150-214



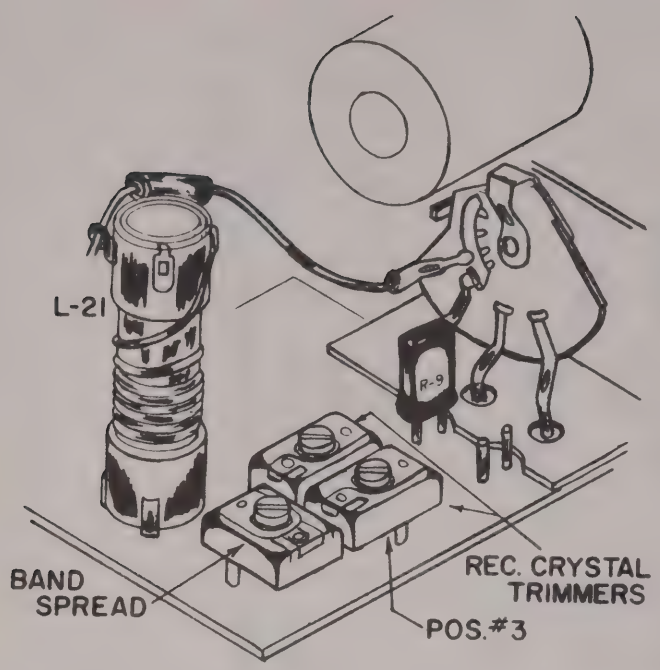
12 VDC Pos Gnd 150-215



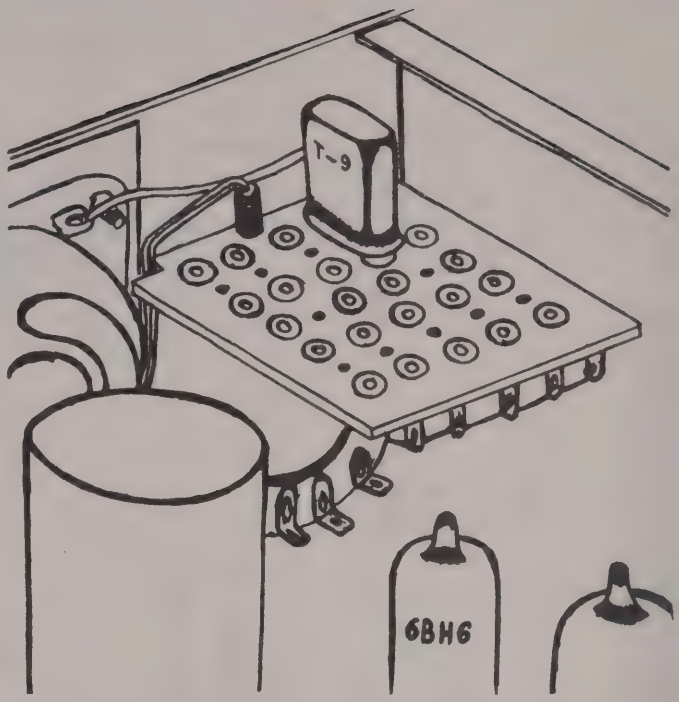


EXECUTIVE MODEL 100D

BLOCK DIAGRAM



RECEIVER OSCILLATOR



TRANSMITTER OSCILLATOR

RECEIVER OSCILLATOR

The EXECUTIVE is delivered with a channel 9 receiver oscillator crystal in position #2 and may be operated to tune all 23 channels of the citizens band with the RECEIVE SELECTOR switch in TUNE position. For fixed tuning in either one or two channels install INTERNATIONAL type "R" miniature crystals for specific channels. The two crystals from left to right are controlled by positions #2 and #3 respectively on the RECEIVE SELECTOR switch. Type "R" crystals are listed in Section IV of this manual.

TRANSMITTER OSCILLATOR

The EXECUTIVE is equipped with one channel 9 transmit crystal. Additional crystals may be installed to permit transmission on either one or more channels. From left to right, the twelve crystals are controlled by positions #1, #2, #3, etc. respectively on the TRANSMIT SELECTOR switch. Transmit crystals are listed in section IV of this manual.

SECTION III
INSTALLATION

The actual placement of the EXECUTIVE unit makes very little if any difference, in its performance. In planning an installation the transceiver should be placed where it will save the most steps. For instance, if the unit is installed in a home to provide communications between the wife at home and her husband in the car, the basement would be a poor location. A more desirable location would be at or near the portion of the house where she spends most of her time, such as in the kitchen, den, or possibly the living room.

FIXED LOCATION INSTALLATION

Operation of the EXECUTIVE from any fixed location such as the home or office will always be best with an outside antenna. A full discussion of antenna selection is given at the end of this section.

MOBILE INSTALLATION

It is possible that the EXECUTIVE, when used in a car or other mobile application, may use a short, base loaded whip, mounted on the rear of the unit. It will not however, prove to be very satisfactory. For best results, a whip, mounted outside the vehicle is required. It may be mounted with a bumper mount on the rear bumper, or may be mounted on a rear fender or cowl, using a ball mount.

The EXECUTIVE itself should be mounted under the dash or in some other practical place in the vehicle. A special mobile mount, designed for the EXECUTIVE is available from INTERNATIONAL which allows the unit to be securely mounted to the car, yet be very easily and quickly removed. Information on this mount is given in the ACCESSORIES section of this manual. Various types of antenna mounts and microphones are also available from INTERNATIONAL.

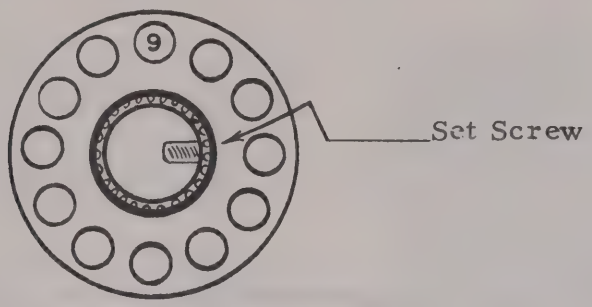
Installations in cars, planes, boats or other locations near gasoline engines present special problems of their own due to noise created by spark plugs, distributor, voltage regulator and generator. A typical mobile installation is shown below. Measures which help reduce this noise are discussed at the end of this section.

When making a mobile installation the automobile voltage regulator must be adjusted for a maximum generator charging rate of 7.3 volts on 6 volt systems and 14.7 volts on 12 volt systems. Equipment installed in vehicles having the regulator out of adjustment where the generator charging voltage exceeds 7.5 VDC on 6 volt systems or 15VDC on 12 volt systems shall be considered out-of-warranty.

INSTALLING CHANNEL BUTTONS IN TRANSMIT DIAL.

Turn the knob so the channel 9 button is in the 12 o'clock position. Loosen the set screw and slip the dial plate off the shaft and insert a channel indicating button in the hole desired. Channel 9 button is now position #2 of the crystal bracket. After the button has been pressed in place, line up numeral vertically with a small screwdriver in the slot on the back of the button. Insert a channel button in the next hole and so on. This procedure may be followed for each switch position.

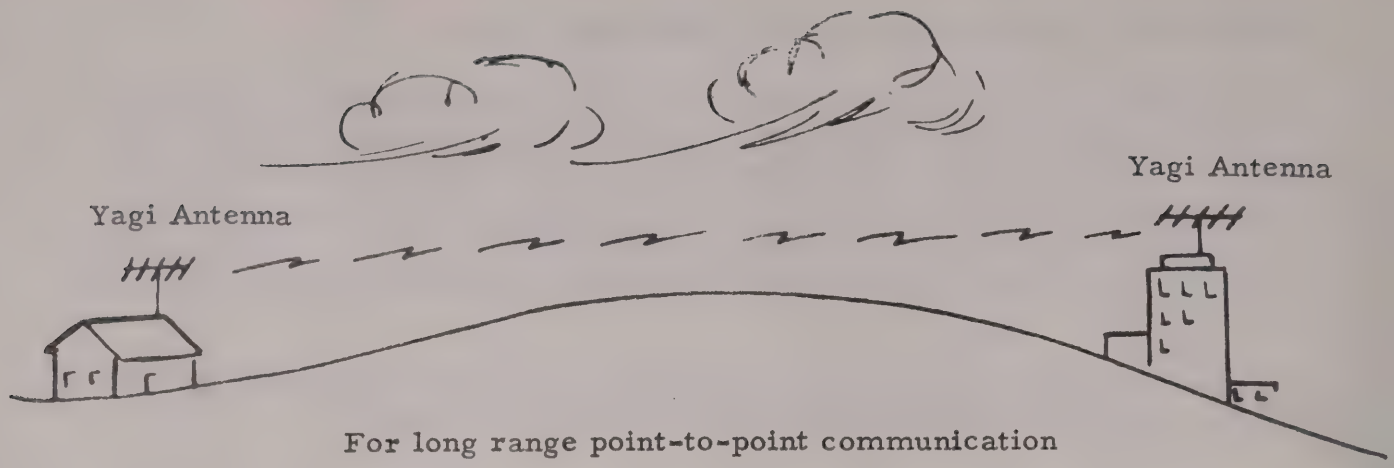
Slip the switch dial plate over the shaft and line up the #9 button with the hole in the front panel and secure in place with the knob set screw.



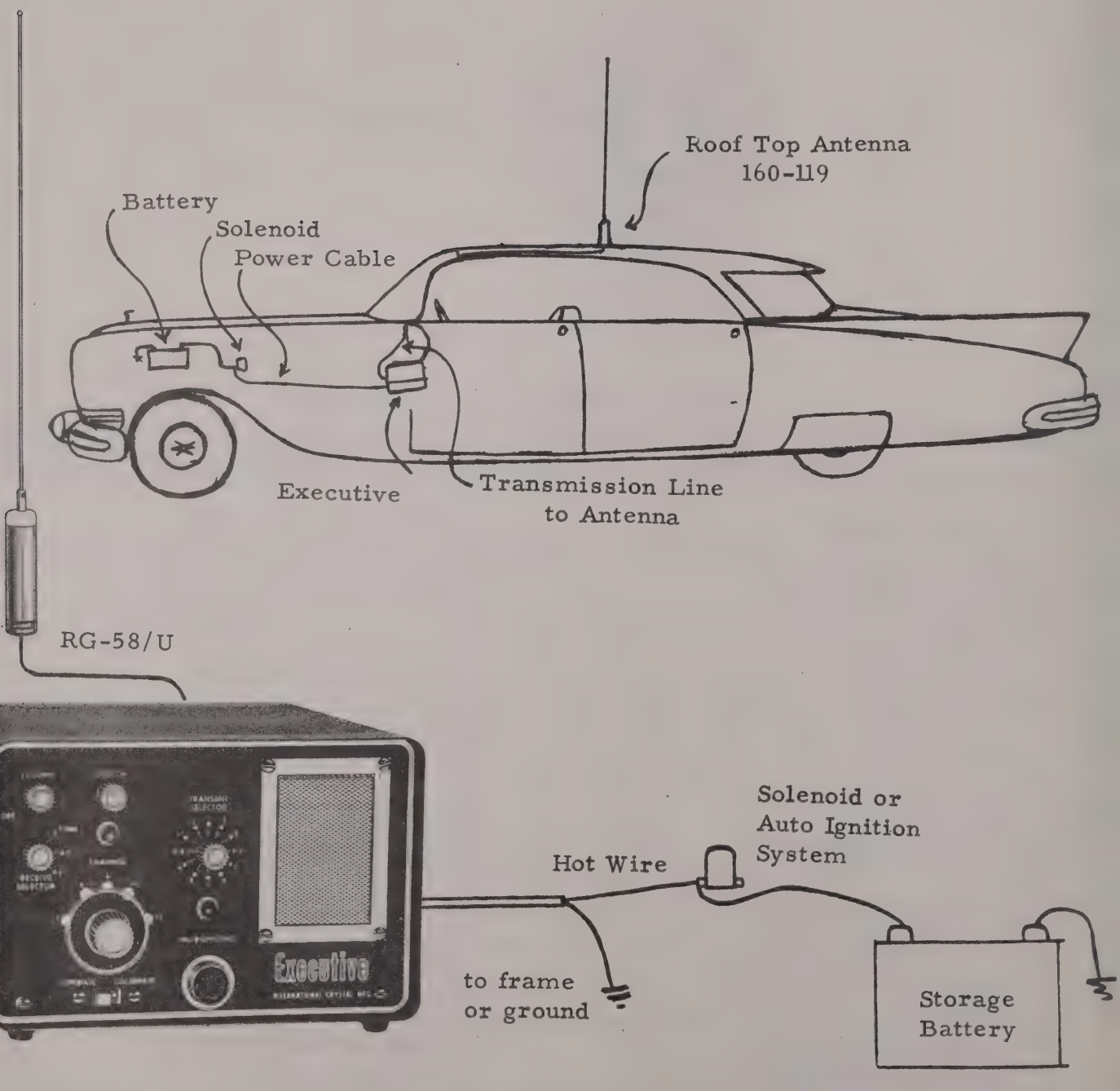
Dial Assembly

SHORT FORM OPERATION CHART

FUNCTION	CONTROL or CONNECTOR
Connect Antenna	ANT jack rear panel
Connect power cord of desired voltage	POWER jack rear panel
Turn set power on and set volume	VOLUME front panel
Turn squelch off	SQUELCH front panel
Tune receiver to desired channel	RECEIVE SELECTOR and CHANNEL dial front panel
Connect microphone	MICROPHONE jack front panel
Select desired transmit channel	TRANSMIT SELECTOR front panel
Transmit by pushing button on microphone	Push-to-talk button on microphone



For long range point-to-point communication



Typical Mobile Installation

ANTENNAE AND THEIR SELECTION

The most common antennae for citizen use are the Ground Plane and Coaxial for base use and the Vertical Whip for mobile use. The Yagi multi-element beam antenna can be used to great advantage where point-to-point communication is required rather than non-directional coverage from the base station. Any antenna with a directional gain will effectively increase the radiated power of the transmitter as well as the received signal applied to the receiver.

It is best to purchase a good commercially built antenna rather than attempt to construct your own. Good commercial antennae have low SWR (standing wave ratio) which is a merit of the radiation efficiency. With home constructed antennae it is sometimes difficult to effect a good match between the antenna and the transmitter causing considerable power to be lost in the system. An antenna should have an SWR of no more than 2:1.

Some power will be lost in the transmission line and therefore long runs should use the larger RG-8U cable. This cable has a lower loss per foot than the smaller RG-58/U. Both types have a characteristic impedance of 53 ohms. Loss per 100 feet at 27 megacycles is 1 db for RG-8/U and 2 db for RG-58/U. For short runs the RG-58/U cable is more easily handled.

Most of the antennae are available in two grades. The lower priced standard grade will not be as mechanically strong as the commercial grade. Electrically both grades are usually about equal. Where ice loads, wind, and salt air are a factor it will be cheaper in the long run to purchase the better antenna.

For extremely short range communication (less than a mile) the base loaded case whip antenna works very well. With two units using case whips, the signals will become quite weak after a block or two and poor squelch operation will be encountered. The outside antenna is by far the best choice and should be mounted as high as practical and still be within F.C.C. regulations. [Paragraph 19.25(c)]. In brief, the F.C.C. limits antenna height to no more than 20 feet above an existing structure or not to extend above the top of the radiating element on an existing tower. Remember the Yagi type antenna is usually mounted in a horizontal position. This type antenna must be used with another antenna mounted in the same plane. If the Yagi is to be used to communicate with mobile units using a whip antenna, the Yagi should be mounted in a vertical plane. A little thought in antenna installation will greatly improve your coverage.

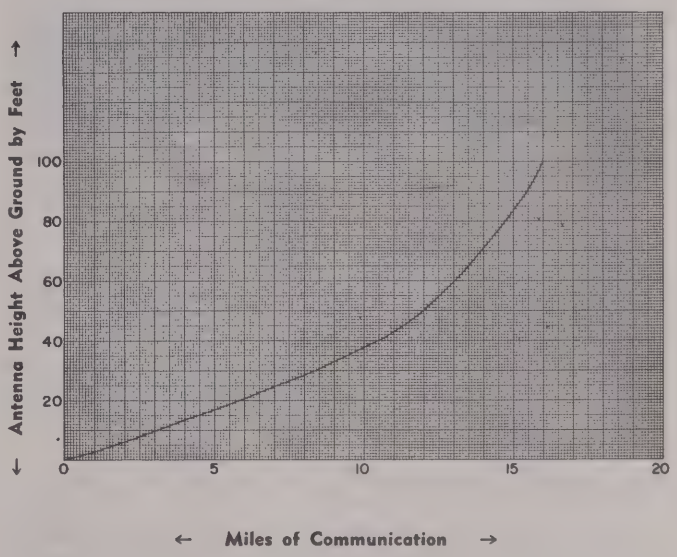
DISTANCE vs ANTENNA

The direct coverage you are able to obtain using Citizen Equipment in the 27 megacycle band will depend a great deal upon the antenna. We shall speak of direct coverage rather than skywave coverage wherein you may communicate 500 to 2000 miles at various times.

The F.C.C. has intended the Citizen use to be for short range communication and all installations should be calculated on this basis. The following charts consider a base station antenna mounted on a mast with the calculated range to a mobile unit using a standard 108" whip. Remember that the antenna may be mounted on an existing structure or mast [reference F.C.C. 19.24(c)].

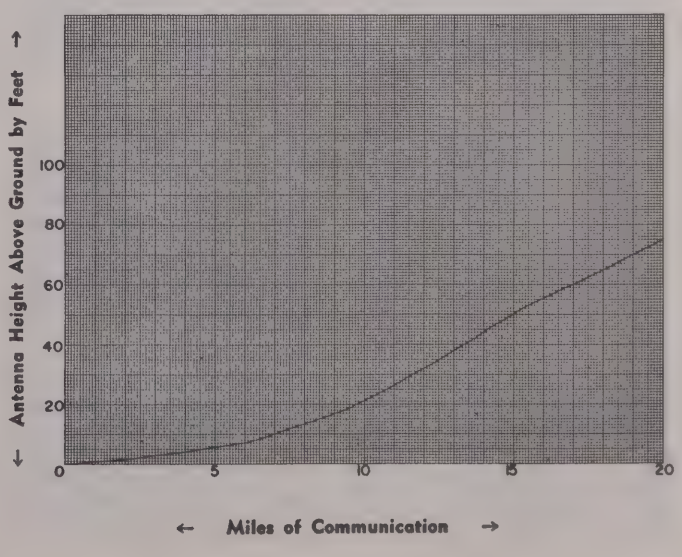
Ground Plane or Coax Antenna For 2 Microvolts at Receiver

Chart #1



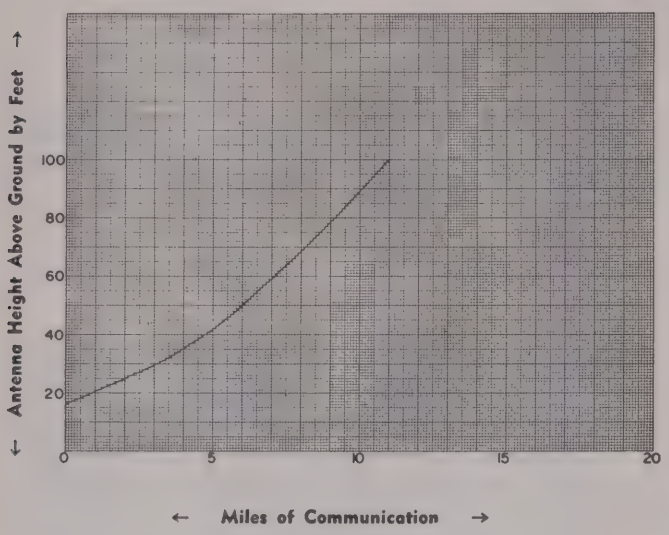
Yagi Antenna Mounted Vertical For 2 Microvolts at Receiver

Chart #2



Ground Plane or Coax Antenna For 15 Microvolts at Receiver

Chart #3



Note how the distance increases with increase height of the antenna for a given installation as in Chart 1. If a direction antenna is used as in Chart 2 you can see how the distance is further increased, however, this reduces the area covered since the Yagi Antenna is quite directional.

Charts 1 and 2 are based on a 2 microvolt signal at the receiver. This signal will not be sufficient for many city areas where high levels of noise exist. Chart 3 considers the coverage for 15 microvolts at the receiver and is more practical for general city use.

When the Citizen frequencies are open to skywave transmission, signals from distant stations will be strong enough to over power weak direct signals. When one is considering communication he should understand that for 100% contact he should base the calculations on 15 microvolts or more.

In mobile communication dead spots will be found at various points as well as locations giving excellent signals. These points should be noted and contacts made from the best possible locations. Vehicle noise and electrical interference will greatly reduce your communicating distance.

ELIMINATE YOUR MOBILE "NOISE GENERATORS"

Now that low cost TWO-WAY radio communication is available to everyone with the opening of the eleven meter band for Citizen use the number of mobile installations will probably exceed the number of base, or control, stations by a factor of 5 to 1 within the near future. It is estimated there are now over 160,000 citizen band mobile installations and approximately 45,000 base, or control, stations in operation. Proper installation and necessary steps towards the elimination of electrical, and mechanical, interference inherent in all motor vehicles is of prime importance if distances of three miles or more are desired to be covered.

For short range coverage the simple installation of a "radio condenser" on the generator and the "interference suppressor" installed in the top of the distributor, or coil, is usually sufficient noise suppression. But when maximum distances of three or more miles must be covered, great pains must be taken and all known means of noise suppression must be used. Different makes and models of vehicles will require different means of noise suppression. Some models only the very simple, others will need the "all out" method.

As there are numerous "generators" of radio interference in every motor vehicle the elimination of one source may not be noticeable as it's noise level may be below one you have not located so the proper way to approach your "noise" problem is by a systematic process of first suppressing all known offenders, namely the generator, voltage regulator, distributor and spark plugs.

We will explain throughout this article what is considered to be the proper vehicle noise suppression methods. The volume of noise you can, or will, tolerate in your receiver will depend upon the amount of suppression applied. Few installations will require the "all out" method and the user must decide when he is satisfied.

The purpose for eliminating your own "noise generators" is the fact that your receiver's automatic volume control (AVC) will react to these random noise pulses the same as though a strong station was tuned-in and will cut the receiver's sensitivity way down which will eliminate the weak stations you normally wish to copy. There's an old saying "if you can't hear them, you can't work them."

Let's start our "noise elimination" with the generator and voltage regulator. The generator is the item that causes the whine as the speed of the motor is increased. It is very easily detected by speeding up the engine and then cutting the ignition off. The instant the switch is turned off ONLY the generator and voltage regulator can cause the noise as all other "noise generators" are eliminated when the switch is off EXCEPT the generator as it is still in operation and is still trying to charge the battery through the voltage regulator. Even though it will operate only a few seconds after the switch is off this is time enough for you to hear the terrific amount of noise it is generating. As the speed of the engine decreases the whine will decrease in unison.

Practically all vehicle manufacturers cable the two leads from the voltage regulator to the generator in a harness with other wires. It is recommended that both of these wires be run in **separate** tinned copper braid. Just disconnect the present wires from the generator and the other end of them at the voltage regulator's "A" and "F" terminals. They can be cut-off where they enter the harness or just taped down out of the way.

A Sprague 48P18 coaxial capacitor, or a similar .5 mfd coaxial capacitor, should be installed directly ON the generator and the lead from the condenser to the battery armature terminal of the generator must be as short as possible. In fact a length of one inch is sometimes too long. A .001 mfd mica capacitor should now be installed from the same battery terminal to the frame of the generator, here again lead length is extremely important and they should be no longer than one-quarter inch. Be sure to remove paint and grease on the generator where the capacitor is bolted as a "good" ground at this point is necessary.

Dress the cable from the coaxial capacitor on the generator against the body of the car. Use speed clips to keep in place or run through presently installed cable clamps. This cable is usually the longest "noise generator" we must suppress and it is preferred to shield this wire in tinned copper braid. The end of the braid must be soldered directly to the coaxial capacitor's body. Be sure to use size #12 copper stranded wire when making-up this new lead. Connect a new cable to the generators' "F" (field) terminal and run this lead in a tinned copper braid shield and dress it along side the battery lead. This new lead may be of size #16 copper stranded wire.

The voltage regulator is next and the "job" from here on is usually easy compared to the one just completed. Remove the cover from the voltage regulator and clean off any paint that may insulate the cover from the frame. Check the mounting screws and be sure the regulator is being grounded directly to the firewall. If necessary remove and clean away any paint so you may secure a "perfect" ground connection.

Use two 48P3 of 48P5 Sprague coaxial capacitors or similar .1 to .5 mfd coaxial capacitors and install at the "A" and "B" terminals of the regulator. The capacitors metal body must be grounded directly to the firewall. This can be easily accomplished by using a piece of cadimun plated metal about 4" x 4" bent to a 90° angle. Drill two holes for the capacitors and two holes to pass sheet metal screws to bolt to the firewall. Attach the capacitors to the angle with screws and nuts and **also** solder. Locate the assembly so the lead from each capacitor to the "A" and "B" regulator terminals are extremely short. Be sure to clean the paint from the firewall so the bracket will make a good solid ground connection. Attach the cable from the generator's "F" terminal to the voltage regulator's "F" terminal. Connect a .002 mfd capacitor and a 4 ohm resistor, in series, from this point to ground. Again, lead length is important and the overall length of the capacitor-resistor combination must be as short as possible. Attach the lead from the generator's armature terminal to the coaxial capacitor connected to the voltage regulator's "A" terminal. The shielding braid on these leads must be grounded to the capacitor bracket or to the firewall by soldering or with the use of washers and sheet metal screws. Attach the "B" battery lead to the coaxial capacitor connected to the "B" terminal of the voltage regulator. This is the lead coming through the firewall and usually goes direct to the battery charging indicator on the vehicles dash panel.

The next superb "noise generators" of them all are the spark plugs. But here we have available to us years of research for only a few dollars. Just go to your local auto supply store and purchase a complete set of AUTO-LITE RESISTOR spark plugs that are direct replacements for your particular brand and model of vehicle. CAUTION: We own no stock in Auto-Lite, but please accept no "substitute" as some **resistor** plugs will actually increase your noise problem. Be patient, if your dealer does not stock your size just ask him to get them for you. When installing the new plugs be sure to have the gap properly set.

After **properly** installing the "recommended" suppression to these trouble makers you should be able to drive comfortably and communicate with stations you never heard before with your engine running. However, in most cases this is only the beginning of the job in order for you to say that you have a good mobile installation.

If you have been checking your "noise elimination" progress as you complete each step we know you will be extremely pleased with your work. But from here on each suppression job will not be very noticeable until you hit the one big joker that's causing a lot of trouble. The little "noise generators" will be obscured by this one and wouldn't have showed up until it was eliminated. All-in-all the little ones can really add up and must be taken care of in due time.

Have your distributor checked to see that the capacitor across the breaker points has the proper capacitance and the points are properly set. If the vehicle has been driven 30,000 to 40,000 miles or more it is recommended that the distributor cap and rotor be replaced. This will usually not only reduce the ignition noise, but also improve the overall performance of the engine. At the same time have the timing checked and properly adjusted.

When purchasing your new AUTO-LITE resistor spark plugs also buy enough 4,000 ohm-per-foot ignition cable to make up a new wiring harness from the distributor to the spark plugs. Be sure that the new terminals (ferrules) are installed whereby they make **good** contact with the center conductor of the new cable. It is preferred that the ferrules be soldered rather than crimped on as there is danger of a poor contact causing another "noise generator" to appear.

Check your ignition wiring by shorting out each plug, in turn, while listening to the receiver. Any reduction in the noise level will usually indicate that the ferrules are not making good contact in the distributor head, or the ferrule and center conductor should be soldered.

Install a 10,000 ohm carbon suppressor in the distributor's center terminal and make up a new lead to run to the coil. Here again be sure the ferrules are soldered and are making a "tight" connection inside the coil and distributor. A new lead is recommended here as any breaks what-so-ever in the ignition system's wiring insulation could be a source of "ignition noise." With very short leads connect a .001 mfd disc ceramic capacitor from the coil's battery terminal to the coil's case.

Bonding braid should now be run from the fire wall, coil, and the distributor to the engine. Use as short a piece of braid as possible in each case. If the ground lead of the battery is attached to the fire wall it should be removed and attached to the starter mounting bolt. The power cable ground lead for your transceiver should also be connected at this same point. Usually the hot and ground leads from the battery go direct to the starter's

solenoid which is mounted on the starter and this is a good place to connect the transceiver's power cable. CAUTION: Remove the hot cable from the battery before making connections to the starter as there is danger of the hot battery cable getting loose and shorting out the battery or even starting a fire.

Connect a short piece of bonding braid across each engine hood hinge. NOTE: The hood will act as a shield to help keep the engine noise inside the engine compartment and away from your antenna. Next connect a short length of bonding braid across each trunk lid hinge, front of the engine to the frame, exhaust tail pipes to the frame, and a piece of wire braid from the air cleaner to the fire wall. It is very important that we caution you to be sure that you clean away all paint, grease or insulation material when installing the grounding braid as **good,** low resistance, ground connections must be made.

Noisy tires should be treated with an anti-static powder, brake shoes grounded to the backup plates with bonding braid and static collectors installed inside the front wheel grease retainer cups. Heat and oil indicator sending units on the engine must be by-passed with .1 to .5 mfd capacitors, again using very short leads. All instrument panel gauges and accessories should be by-passed using .5 mfd capacitors. Heater and defroster motors, electric windshield wiper motors and any other accessory motors by-passed with a .25 to .5 mfd capacitor. The gasoline sending unit mounted on the gasoline tank must be by-passed with a .1 to .5 mfd capacitor. An inspection plate is usually provided in the trunk compartment over the tank.

For the person who desires the "ultimate" in mobile "noise elimination" there are available for some vehicles marine and aviation spark plugs that could be used and the complete ignition system shielded by using these plugs and making metal boxes to enclose the distributor and coil, and shielding all wiring associated with the ignition system. By having the ignition system **completely** shielded most of the "suppression" can be eliminated and the normal high engine performance will be maintained.

You should set aside a week-end for your "noise elimination" project and have all necessary parts and tools available. You may visit your local two-way radio communications company and secure most of the parts required in kits furnished by some manufacturers of two-way radios. The other parts required are available from radio parts supply and auto parts supply firms.

Lay out your line-of-attack and as each "noise generator" is suppressed it should be noted and checked by listening to the receiver or noting the receiver's "S" meter indication before and after the suppression. This indicates the noise level entering the receiver that is being picked-up by the antenna. To check the noise level entering the receiver by the antenna connecting cable disconnect the cable where it connects to the antenna and short the cable's terminals. If noise is still noticeable it will be necessary to re-route the cable under the vehicle and up through the fire wall to the transceiver. Check the noise level entering the receiver through the power cable by disconnecting the antenna connecting cable at the receiver. All noticeable noise in the receiver is now being picked-up by the power cable and fed to the receiver. This can usually be eliminated by installing a Sprague 48P3 feed-thru coaxial capacitor on the fire wall and the hot battery lead from the transceiver connected through the capacitor to the battery terminal.

We sincerely hope that we have been of some help to you and assure you that when you finish your "noise elimination" project you will consider yourself an "**expert.**" But just as a parting reminder, remember that all of those cars along side of you, up front, behind and the ones passing have not been through the "elimination" process and it will be up to your receiver's built-in noise limiter to cut **their** noises down to a listening level that is bearable.

Reprinted by International Crystal Mfg. Co., Inc.
From Class "D" Citizens Band Radio 1960 Call Book

SECTION IV

ACCESSORIES

MMR-1 MOBILE MOUNT

Available from INTERNATIONAL is a mobile mount designed with the customer's convenience in mind. This accessory permits the transceiver to be installed or removed from the car by simply pulling the unit out, much in the same manner as an ash tray. Details of the mount are shown on another page in this section.

ANTENNAS

Without an efficient antenna, operation of your Executive is not as enjoyable as can be experienced with a well designed antenna system. INTERNATIONAL has available antennas for almost any installation. Base Station end fed vertical antenna Stock No. 160-116, price $28.43. Roof Top mobile antenna, Stock No. 160-119, price $15.68.

EXECUTIVE CRYSTALS

Crystals for the 12 position crystal switch assembly and all other Executive units are also available for transmitting and receiving channels 1 to 23. Frequency and part numbers of these crystals are listed on another page in this section. Price each . . $4.75.

POWER PLUGS

For our customers who have only one unit and wish to use it in several different locations, INTERNATIONAL offers five different power plugs which will allow the Executive unit to be used anywhere.

6VDC	plug	-gnd	Part No.	150-212	Price each	$7.50
6VDC	plug	+gnd	Part No.	150-213	Price each	$7.50
12 VDC	plug	-gnd	Part No.	150-214	Price each	$7.50
12 VDC	plug	+gnd	Part No.	150-215	Price each	$7.50
115 VDC	plug		Part No.	150-174	Price each	$7.50
DC	plug kit		Part No.	150-191	Price each	$3.95
AC	plug kit		Part No.	150-192	Price each	$3.95

"S" METER KIT

Designed for installation in the speaker grill opening of the Executive Model 100-D transceiver, this accessory allows the operator to visually monitor the relative signal strength of received signals.

Stock No. 150-234 Price each . . . $19.95

SPEAKER ENCLOSURE KIT

For those operators who desire an external speaker the International Speaker Enclosure Kit is designed for over or under dash mounting or rear deck mounting. Painted in matching brown it will make an attractive addition to the mobile or fixed station installation.

Stock No. 150-235 Price each . . $5.75

CRYSTALS FOR EXECUTIVE MODELS 50 & 100 CITIZEN BANDERS

		TRANSMITTER		RECEIVER (Type "R" Miniature)	
Channel Number	Channel Frequency	Stock Number	Crystal Frequency	Stock Number	Crystal Frequency
1	26.965 mc	900-101	13482.50 kc	900-179	16965.00 kc
2	26.975 mc	900-102	13487.50 kc	900-180	16975.00 kc
3	26.985 mc	900-103	13492.50 kc	900-181	16985.00 kc
4	27.005 mc	900-104	13502.50 kc	900-182	17005.00 kc
5	27.015 mc	900-105	13507.50 kc	900-183	17015.00 kc
6	27.025 mc	900-106	13512.50 kc	900-184	17025.00 kc
7	27.035 mc	900-107	13517.50 kc	900-185	17035.00 kc
8	27.055 mc	900-108	13527.50 kc	900-186	17055.00 kc
9	27.065 mc	900-109	13532.50 kc	900-187	17065.00 kc
10	27.075 mc	900-110	13537.50 kc	900-188	17075.00 kc
11	27.085 mc	900-111	13542.50 kc	900-189	17085.00 kc
12	27.105 mc	900-112	13552.50 kc	900-190	17105.00 kc
13	27.115 mc	900-113	13557.50 kc	900-191	17115.00 kc
14	27.125 mc	900-114	13562.50 kc	900-192	17125.00 kc
15	27.135 mc	900-115	13567.50 kc	900-193	17135.00 kc
16	27.155 mc	900-116	13577.50 kc	900-194	17155.00 kc
17	27.165 mc	900-117	13582.50 kc	900-195	17165.00 kc
18	27.175 mc	900-118	13587.50 kc	900-196	17175.00 kc
19	27.185 mc	900-119	13592.50 kc	900-197	17185.00 kc
20	27.205 mc	900-120	13602.50 kc	900-198	17205.00 kc
21	27.215 mc	900-121	13607.50 kc	900-199	17215.00 kc
22	27.225 mc	900-122	13612.50 kc	900-200	17225.00 kc
23	27.255 mc	900-123	13627.50 kc	900-201	17255.00 kc

MMR-1
Mobil Mounting Rack

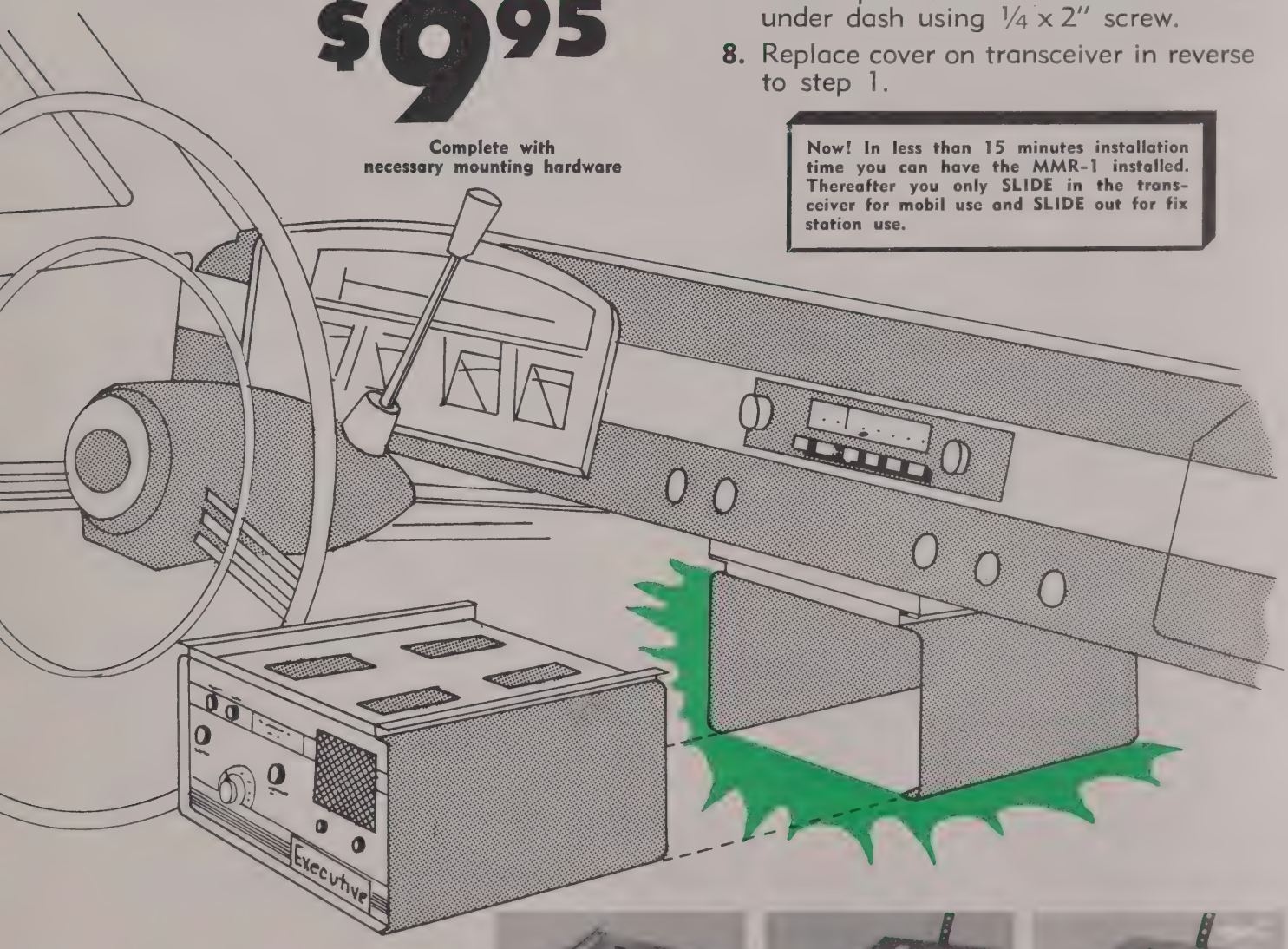
ONLY
$9.95

Complete with
necessary mounting hardware

INSTALLATION INSTRUCTIONS

1. Place transceiver up-side-down and remove the four rubber feet. Turn transceiver right side up and spread case at bottom and remove.
2. Place part **A** on top of cabinet and drill four (4) 3/16" holes.
3. Use #8 x ½" screws and bolt part **A** to case. (with screw heads inside case.)
4. Use #8 x ½" screws and bolt strap **C** to part **B.**
5. Position part **B** under dash. Drill two (2) 3/16" holes.
6. Use #8 x 1" screws and bolt part **B** under dash.
7. Fasten part **C** to fire wall or a brace under dash using ¼ x 2" screw.
8. Replace cover on transceiver in reverse to step 1.

Now! In less than 15 minutes installation time you can have the MMR-1 installed. Thereafter you only SLIDE in the transceiver for mobil use and SLIDE out for fix station use.



International
CRYSTAL MFG. CO., Inc.
OKLAHOMA CITY, OKLAHOMA

Mobil Mounting Rack

SECTION V

SERVICE AND MAINTENANCE

GENERAL

As is the case with all types of electronic equipment, the EXECUTIVE should be checked periodically by a qualified technician to insure optimum performance at all times and to correct any condition which might later result in equipment failure due to improper adjustment, tube aging or component failure. Since the EXECUTIVE series receiver differs somewhat in its design from conventional Citizen Band radio sets, no attempt should be made to service this equipment until the technician has become completely familiar with the basic circuitry and has a thorough understanding of the characteristics of dual conversion equipment.

In general, maintenance can be simplified by seeking a definite symptom of a fault and establishing, by reference to the block and schematic diagrams, a condition or series of conditions which might cause the symptom. This will usually help to localize the source of trouble and eliminate those sections of the equipment which are operating properly.

Many technicians tend to overlook the very simple and more obvious sources of trouble in their service work. This may be brought about by a nontechnical operator's description of a particular fault. For example, a Citizen Band operators complaint of intermittent operation may immediately suggest relay trouble or any number of things to a technician. Yet, upon checking further, the trouble may actually be caused by a defective antenna connector or a loose microphone plug or some other condition completely external to the set. For this reason, always quickly check the entire installation for potential trouble before actually removing the set for maintenance work.

DISASSEMBLY OF THE CABINET

The front and rear panels of the unit are bolted to the chassis. The cabinet is of wrap-around construction divided into two pieces. The perforated top section may be removed for easy access to all tubes without removing the bottom section. Remove the six (three on each side) large sheet metal screws and fibre washers and lift off the top section. To remove the bottom section remove the four sheet metal screws located inside the rubber feet and two additional sheet metal screws one at the back and one at the front on the bottom of the unit.

To re-assemble, simply reverse the procedure outlined above.

TEST EQUIPMENT

A properly equipped Citizen Band service shop will probably have most of the basic test equipment for servicing the INTERNATIONAL EQUIPMENT. Because of the much closer frequency tolerances used on Citizen Band radio equipment, greater precision is required of all alignment generators and frequency measuring equipment. A good stable HF signal generator will be most helpful when alignment of the receiver is necessary. Hewlett-Packard type 606-A signal generator is a good example of the type and quality of instrument which has the inherent stability and accuracy that is desirable for servicing Citizen Band radio equipment. An accurately calibrated attenuator with an auxiliary pad to reduce the generator output to 0.25 microvolts or less is very desirable for absolute receiver sensitivity measurements.

For receiver audio recovery measurements, the Heath Model AV-3 Audio Vacuum Tube Voltmeter will provide the necessary accuracy required in this test.

For frequency measurement and modulation percentage checks, the INTERNATIONAL Model C-12B Frequency meter is highly recommended. This versatile instrument specifically designed for use on the Citizen Band Channels, allows the technician to make accurate frequency and modulation checks with the minimum of set up time. The instrument can also be used as an accurate frequency standard for calibration of other equipment on Citizen Band channels.

An adequate source of well filtered low-voltage DC which can be varied over a minimum range of 5 to 15 volts with ample current capacity for good regulation is extremely desirable for service work. Although several automobile batteries can be used with taps at each cell to provide a crude range of adjustment, the upkeep and long range maintenance cost will invariably prove to be more costly than a good battery eliminator type of DC supply. One unit of this type is the Heath Model BE-5. Regulation and filtering are adequate for use directly without the need for batteries.

NOTE:

Detailed information and prices on the instruments mentioned above may be obtained by contacting the appropriate manufacturer at the address listed below:
Hewlett-Packard Co., 275 Page Mill Rd., Palo Alto, Calif.
Bird Electronic Corp., 1800 E. 38th St., Cleveland 14, Ohio
International Crystal Manufacturing Co., Inc., 18 N. Lee, Oklahoma City 2, Oklahoma
Heath Company, Benton Harbor, Michigan

PREVENTATIVE MAINTENANCE

Wherever possible, a routine program of preventive maintenance should be set up on all INTERNATIONAL Executive radio installations in order to insure maximum equipment utilization with the least number of interruptions for service work. The following list has been prepared as a guide to indicate items which should be included in a preventive maintenance program. Unusual environmental or installation conditions may make it necessary to expand or alter this list to meet individual requirements in the field.

GENERAL

Check all plugs, connectors, tubes, and fasteners for proper seating. Where equipment is subjected to extremely dusty conditions, occasionally remove the set from its case and dust with a clean, dry brush or with a clean, DRY source of compressed air. Clean the relay contacts only by drawing a small strip of ordinary bond letter paper between the contacts while holding gentle pressure on the relay armature. Do not use a file, sandpaper or any abrassive on relay contacts. The contacts are gold-plated and need only occasional cleaning to remove dust or foreign material. Vacuum or brush out any dust in the case before reinstalling the set.

MOBILE INSTALLATIONS

Check the battery connections. These must be clean and tight at all times. Check the battery at frequent intervals for condition and electrolyte level. Add water, as required, to keep the electrolyte at the proper level.

Inspect the power cable for evidence of physical damage. Check the microphone plug, cable and hanger bracket. Check all plugs and connectors for proper seating and security. Inspect the antenna system carefully. Remove the antenna plug from the set and check for continuity between the center contact of the plug and the actual antenna rod with a low range ohmmeter. Straighten or replace any bent or damaged antenna rods.

Check the voltage regulator for proper operation with the engine running. Adjust the regulator, if necessary, to prevent a voltage in excess of 7.5 volts on 6 volt systems or 14.5 volts on 12 volt systems when the generator is operating at its maximum output.

Inspect the distributor and spark plug wiring. Be sure all terminals are clean, bright and fit securely.

BASE STATION INSTALLATIONS

Check the primary line voltage to make certain it is within its normal limits. If the line voltage is subject to very large fluctuations, install a constant voltage transformer of appropriate capacity.

Inspect the microphone plug, cable and hanger bracket for evidence of excessive wear or damage. Check the antenna system, including the mast or tower, guy wires and coaxial cable. Be sure to inspect the ground wire for the mast or tower. All connections at the tower and ground rod should be clean and tight.

MINIMUM PERFORMANCE

The following routine measurements should be made at periodic intervals. If within the range indicated below, the set can be considered in good operating condition.

1. Check the receiver as follows with no signal input. This can be measured with a VTVM and audio output meter. The Volume control should be wide open, Squelch control OFF, Receive Selector in TUNE position and Tuning Dial set at Channel 9. The AVC voltage at terminal #23 on the IF unit should be from -.3 to -.5 and Audio Output across speaker terminals from .05 to .08 VAC. Typical meter readings with a 1 uv 400cps 30% modulated signal are -1.3 to -2.0 volts AVC and 1.75 volts AC or better on the audio output meter.

2. Check the receiver frequency calibration using the C-12B as a signal source on Channels 1, 9 and 22. If the Tuning dial pointer falls within 1/16th of an inch of the Channel numbers marked on the panel, the calibration is satisfactory.

3. Check the transmitter power output with a RF wattmeter. Rated output at standard input voltages of 6.8, 13.6 and 115 volts should be measured. (Normal 2 to 2.5 watts.)

4. If a reflected power meter is available, check the reflected power when transmitting. The reflected power should be almost negligible if the antenna, coax and transmitter are properly matched.

5. Check transmitter output frequency. Frequency should be .005% or better.

TROUBLE LOCALIZATION

To correct any trouble which may occur in the equipment, first try to isolate the section of the set which causes the trouble. In many instances a good visual inspection of the set will clearly indicate where the defective component is located. Reference to the block diagram of circuit functions and the schematic diagrams on the various sections of the receiver, transmitter and power supply, together with the following list of typical symptoms with probable sources of faults will be helpful in servicing the equipment.

When tubes are indicated as being the cause of the trouble, substitute a new tube of the same type for the one suspected of failure. If no improvement is noted, the original may be reinstalled. It should be noted that where tubes are referred to as trouble possibilities, the circuit components immediately associated with that particular tube may also be the source of trouble.

In trouble shooting the equipment, first check the power supply on 6 and 12 volts DC and 115 volts AC. If trouble is not in the power supply, all further checks can be made on 115 volts AC.

Connect a 115 volt power cord to the unit and remove the antenna and connect a dummy load. The dummy load can be made by connecting a #47 pilot lamp across a spare antenna plug and plugging this into the antenna jack of the unit.

VOLTAGE AND RESISTANCE MEASUREMENTS

The voltages and resistances measured at pertinent tube socket pins as well as power pin terminals are shown in the sectional schematic diagrams just preceeding the main schematic diagram at the back of this manual.

The receiving condition voltages are preceeded by the letter "R". Transmitting condition voltages are preceeded by the letter "T". Resistance values preceeded by Res., were measured with power off. AC power plug in place and squelch and volume controls off. Filter capacitors were discharged prior to resistance measurements. The filament voltages are not marked AC or DC, as this will depend on whether or not the unit is being operated on the AC line or on battery input voltage.

All voltage readings were taken with the unit operating from 115 volts AC. Voltages measured when using battery input voltage will differ somewhat from those shown for 115 volt operation.

POSSIBLE TROUBLE CHART

POSSIBLE POWER SUPPLY TROUBLES

COMPLAINT	POSSIBLE TROUBLE	REMEDY
No B + voltage (AC or DC)	Fuse, switch, rectifiers	Replace defective parts
No B + voltage (DC)	Fuse, transistors, Q1 & Q2	Replace defective parts, repair cable
	Bad connection on power cable	
	Defective Transistor	Replace defective par
	transformer 512-118A	Replace defective par
	Resistors R-70 & R-71	
B + Low (DC)	Battery output low	Charge battery
	Loss in power cable	Correct defect in cabl
	Defective transistors Q1 & Q2	Replace defective par
	Resistors R-70 & R-71	Replace defective par
B + Low (AC or DC)	Short in B + line	Remove short
	Low resistance B + line to ground	Remove defective component
	Defective rectifiers	Replace defective par
	Defective power transformer	Replace defective par

POSSIBLE TRANSMITTER SECTION TROUBLES

No RF Output	Defective V8 or V9	Replace tube (s)
	Open L14 or L15	Replace Coil (s)
	Open L16 or L19	Replace Coil (s)
	Open C80	Replace capacitor
	Open secondary winding of modulation transformer T-3	Replace transformer
	Defective transmitter crystal	Replace crystal
	Poor relay contacts	Clean contacts
Low RF Output	L17 & L19 improperly adjusted	Re-adjust coils as per recommended procedure
	C78 & C79 improperly tuned	Re-adjust capacitors
	Weak V8 or V9	Replace tube (s)

No Modulation	Defective V6, V7 or V10	Replace tube (s)
	Defective modulation transformer T-3	Replace transformer
	Mike Gain Control on Audio Board improperly adjusted	Readjust as per recommended procedure
	Clipper control R-57 improperly adjusted	Readjust as per recommended procedure
Low Modulation	Check as per above Low Grid Drive to V9	Check V8 & alignment of coils L17 & L19

POSSIBLE RECEIVER SECTION TROUBLES

Dead (No Sound)	Defective V1, V2, V3, V4, V5, V6, V7	Replace tube (s)
	Open Audio Filter Choke L12	Replace choke
	Shorted Capacitors C70 or C71	Replace capacitors
	Defective Crystal Y-1	Replace crystal
	Dirty Relay Contacts	Clean contacts
Low Volume	Defective tube as listed above	Replace tube (s)
	Receiver requires alignment	Align as required

RECEIVER ALIGNMENT

Prior to alignment, the Executive should be turned on and allowed to reach normal operation temperature. This will require approximately 15 minutes. Set the Executive operating controls as follows:

VOLUME to ON position

RECEIVE SELECTOR to TUNE position

TUNING DIAL to CHANNEL 9

SQUELCH to OFF - Fully counterclockwise until switch clicks.

Alignment of the Executive receiver is performed by adjustment of the various stages as follows:

1. The following equipment will be required for the alignment of an executive transceiver with a crystal filter.
   Signal Generator such as H. P. 606A, Clough-Brengle 550 or equivalent. It is important that the signal generator have a good attenuator and very little leakage signal. A generator such as the Heath LG-1 may be used providing an external pad of approximately 60 db is used and the generator operated on its high ranges.
   Crystal Controlled Frequency Standard: INTERNATIONAL C12-B Audio.
   Output Meter such as H. P. - 400D, Heath AV-3 or equivalent.
   Vacuum Tube Voltmeter
   Battery or Battery Eliminator for DC operation of the unit.

2. Disconnect antenna and connect the C-12B to the Executive Antenna terminal, as shown in Fig. 1.

3. Connect the audio meter across the speaker terminals. Use the 3 volt range.

4. Use a Channel 9 receive crystal in position 2 of the Receive Selector Switch.

FILTER ADJUSTMENT

(a) Check filter bandpass

(b) Set receive crystal trimmer for center of bandpass

(c) Adjust 455 KC IF for peak AVC

(d) Check adjacent channel rejection

The above steps are made as follows:

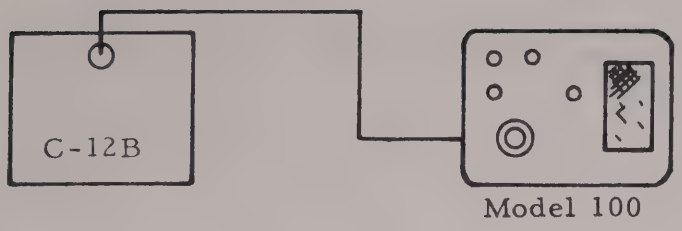


FIG. 1

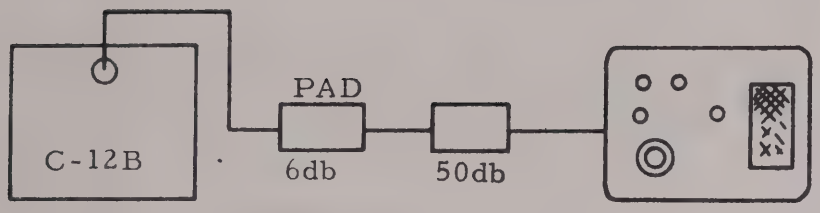


FIG. 2

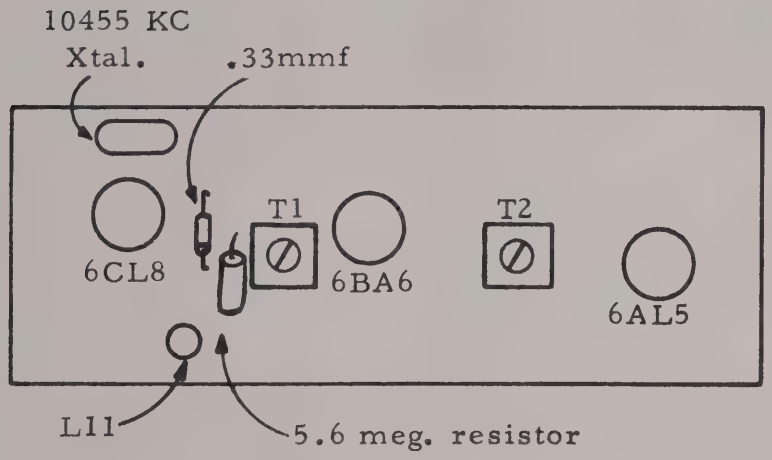


FIG. 3

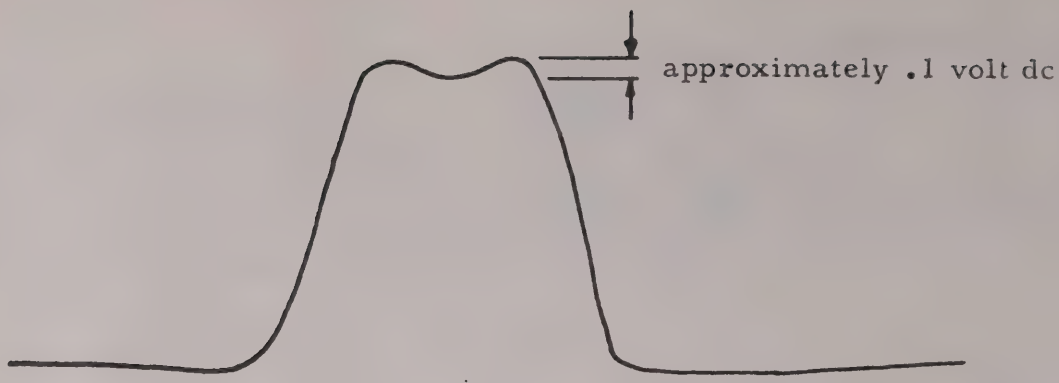
(e) Remove 10455 KC second IF crystal

(f) Connect high impedance DC VTVM probe to grid of second mixer. This will be the extended lead end of the 5.6 megohm resistor. (fig. 3)

(g) Set the Receive Selector to Tune

(h) Apply a channel 9 signal from the C-12B to the Executive model 100 D. Set the C-12B LEVEL control full clockwise. (fig. 1)

(i) Slowly tune the receiver thru channel 9 and note the VTVM reading. Off channel the VTVM will read between .5 and .8-dc. As you reach the channel the reading will increase (depending upon the amount of signal being applied) to 1 volt-dc or more.
NOTE: No signal will be heard in the speaker since the second mixer crystal has been removed. Tune slowly across channel 9. The voltage should vary as below



A correctly adjusted filter should have equal peaks plus or minus .1 volt dc from mean value. The valley between peaks should be no greater than .1 volt dc lower than mean.

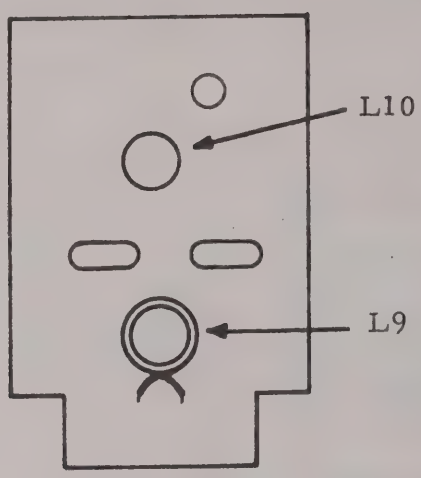


FIG. 4

(j) Where the bandpass is out of tolerance, remove the seal from L10 and L9. L10 will effect the peak height and L9 the depth of the valley. These coils are touchy to adjust and only small changes should be made between each tune thru of channel 9. Normal position of the slug in L10 is near the top of the form to 1/8 inch in the form. The slug in L9 extends approximately 1/16 to 1/8 inch out the top of the form. Alternately adjust L9 and L10 and then tune across the channel until the desired bandpass is obtained. Be sure to seal the slugs after adjustment.

(k) Set the RECEIVE SELECTOR to channel 9 crystal receive and rotate its associated trimmer. Note VTVM reading and leave the trimmer set at a point midway between the bandpass peaks.

(l) Repeat step (k) for each receive crystal using the appropriate channel on the C-12B.

(m) Reinstall the 10455 KC crystal. Install 6db + 50 db pad between the C-12B and the Executive. (fig. 2)

(n) Using channel 9 crystal receive, apply sufficient signal on 9 from C-12B to give 2 to 3 volts AVC as measured at the accessory socket ACC. Peak the 455 KC IF transformers for maximum AVC.

(o) Set the output of the C-12B for 3 volts AVC channel 9. Check the C-12B output on channels 8 and 10 by tuning them in on the receiver. Plus or minus .25 volts of channel 9 level is satisfactory.

(p) Return to channel 9 crystal receive and switch out 50 db of pad. Apply signal from C-12B on channel 8 and 10. The AVC reading should not exceed the level of channel 9 noted with the 50 db pad in the circuit.

NOTE: There should be at least 6 db of pad in the circuit at all times to prevent variation in load to the C-12B. For accurate rejection check, the above settings must be made with care and no signal leakage can be present.

RECEIVER FRONT END ALIGNMENT

1. Turn the signal generator on and set function switch to CW or unmodulated position. Set generator to channel 9 frequency by zero beating generator output with C-12B signal. The zero beat note will be heard in the transceiver speaker.

2. Turn transceiver VOLUME control fully clockwise and set generator function switch to Mod. position. Set modulation level to 30% at 400 cps. Set generator RF output level control to about .3 microvolt and adjust the following coils for peak reading on the audio output meter.

L2	RF grid coil
L1	Antenna coil
L3	RF plate coil
L6	1st Mixer plate coil
L11	2nd Mixer grid coil

After above adjustments have been made, return to coil L6 and rotate the slug 1/4 turn in the direction of minimum inductance.

ADJUSTMENT OF TUNABLE FIRST OSCILLATOR

1. Calibration of the receiver tuning dial must be done with a signal generator of known accuracy. If generator accuracy is questionable, it may be calibrated as previously discussed.

2. Set generator on Channel 9 and rotate Executive tuning dial for maximum audio recovery as indicated on output meter. This dial setting should fall within 1/16th of an inch of the panel marking for Channel 9. If the pointer setting is not within this tolerance, adjustment of the 1st converter oscillator will be necessary. Before making any adjustment to the oscillator, it will be necessary to check the receiver tuning spread.

3. Set generator on Channel 1 frequency. Rotate tuning dial toward Channel 1 panel marking. Tune receiver for maximum audio recovery as indicated by the output meter. Note tuning dial pointer position with relation to channel 1 panel marking.

4. Set generator to Channel 22 frequency. Repeat procedure of step 3. Note tuning dial pointer position with relation to Channel 22 panel marking. If all three check points are off calibration about the same amount in the same direction, the tuning spread is correct and only the tuning slug in coil L21 needs adjusting at the Channel 9 dial setting to bring the unit back into calibration tolerance.

5. If calibration checks OK at Channel 9 and is off at either the Channel 1 or Channel 22 check points, the tuning spread is incorrect and capacitor C23 must be adjusted.

6. In the first instance described under 4, set generator at Channel 9 frequency and tuning dial pointer at Channel 9 panel mark. Using a small insulated hex tuning tool, slowly adjust the tuning slug in oscillator coil L21 for maximum audio recovery as indicated by the output meter. Check calibration at Channel 1 and Channel 22.

7. In the second instance covered under 5, the following adjustments should be made. Set generator to Channel 9 for frequency. Set receiver tuning dial pointer to Channel 9 panel mark. Using an insulated tuning tool, turn the rotor of capacitor C23 in a clockwise direction until it is fully closed. Rotate rotor of C23 in a counterclockwise direction for 1 1/2 turns. Adjust tuning slug in oscillator coil L21 for maximum audio recovery as indicated by the output meter. Check calibration at Channel 1 and Channel 22. If calibration is still not within tolerance, alternately adjust capacitor C23 and tuning slug in L21 until calibration falls within the tolerance limits.

8. Receive crystals installed in the RECEIVE SELECTOR switch assembly crystal sockets can be trimmed exactly to the proper channel frequency by their associated capacitors C26 and C27 as described under paragragh 5, steps (k&l) of Receiver Alignment.

TRANSMITTER ALIGNMENT

The Executive series transmitter alignment can be done with an RF wattmeter, but for a complete check of overall performance the following test equipment will be required.

a. RF wattmeter
b. Frequency meter with an accuracy of at least .0025%-INTERNATIONAL C-12B or equivalent.
c. Vacuum Tube Boltmeter-RCA WV-98B or equivalent.

1. Connect an RF wattmeter to the antenna jack on the back panel of the Executive.

2. Turn the set on and allow 15 minutes for the unit to reach normal operating temperature.

3. Install channel 1, 9 and 23 crystals in the TRANSMIT SELECTOR switch crystal sockets and set to channel 9.

4. Key the transmitter by depressing the microphone press-to-talk switch.

5. Adjust final amplifier tuning capacitor C79 and loading capacitor C78 alternately for maximum output as indicated by the wattmeter.

6. Tuning Grid Coupling Coils. The bandpass coils L17 and L19 are adjusted with the bottom half of the transceiver case in place as follows:

(a) Set VTVM range switch to 150 WDC positive and connect probe to transmitter green TEST JACK. This jack is connected to the screen terminal of the 6CL6 final amplifier tube socket.

(b) Set TRANSMIT SELECTOR switch for output on channel 9. Key transmitter and tune 6BH6 plate coil L19 for minimum voltage on VTVM.

(c) Tune the 6CL6 grid coil L17 for minimum voltage on the VTVM

(d) Tune 6CL6 plate and loading capacitors C79 and C78 for maximum power as indicated by the wattmeter.

(e) Remove channel 9 crystal, key transmitter, and check neutralization for no output as indicated by wattmeter. Adjust neutralizing loop L16 if required.

(f) Install channel 9 crystal and repeat steps (b) thru (e) until final amplifier is completely neutralized.

(g) Now key transmitter and switch transmit selector alternately between channel 1 and channel 23 noting voltage level at test jack as indicated by VTVM. Adjust the 6BH6 plate coil L19 for equal voltage on channels 1 and 23. Leave the 6CL6 grid coil peaked for channel 9.

(h) Test jack voltages will be approximately 130 volts DC on channel 9 and 145 volts on channels 1 and 23.

(i) Seal coupling and neutralization loops in position with RTV compound.

7. The Executive series transmitter has an overall frequency tolerance of .005% or better. UNLESS SUITABLE HIGH-ACCURACY FREQUENCY MEASURING EQUIPMENT IS AVAILABLE, DO NOT ATTEMPT TO ADJUST THE TRANSMITTER FREQUENCY. A small trimmer capacitor C91, is provided to make minor adjustments in the transmitter frequency.

8. Set TRANSMIT-SELECTOR to the Channel previously used for transmitter alignment. Connect C12B Frequency Meter through the PK-1 pick-up box to the transmitter antenna jack.

9. Set up Frequency Meter for measurement on channel to be measured. Depress microphone press-to-talk switch and measure the frequency. If the frequency is out of tolerance, adjust trimmer C91 until the transmitter frequency is within tolerance. If this cannot be accomplished within the tuning range of C91, check the other channels in the set. If they can be brought into tolerance with trimmer C91, the crystal can be considered defective and must be replaced. If they cannot be brought into tolerance, possibly either of capacitors C89 or C90 has changed value.

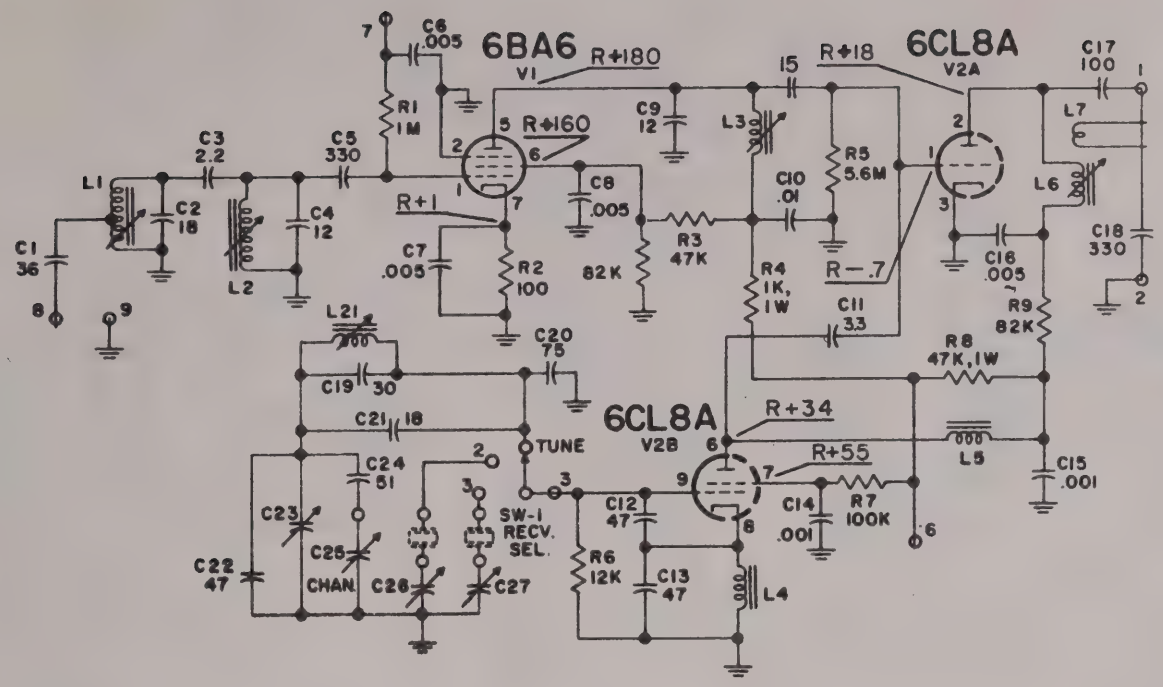
10. Before replacing either of these components, if possible, the crystals in question should be checked in another Executive transmitter. If they still cannot be brought into tolerance, chances are that the crystals are defective and should be replaced. If they can be brought into tolerance in a like unit, capacitors C89 and C90 should be checked and the defective component replaced.

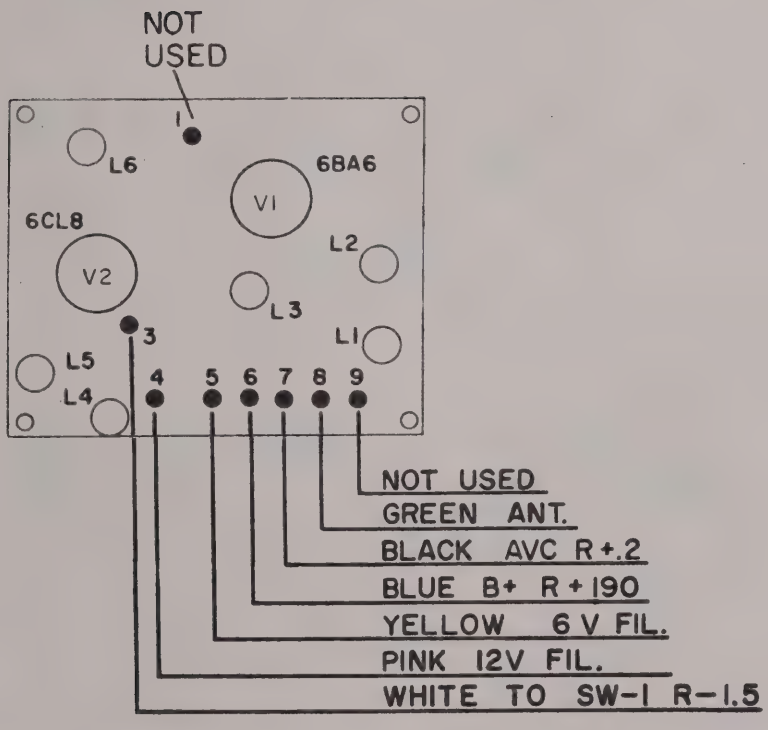
MICROPHONE GAIN AND SPEECH CLIPPER LEVEL CONTROLS

The Microphone Gain (MIC. GAIN) is located on the Audio board. Access to this control is thru a hole in the back panel of the transceiver. This control varies the output level from microphone amplifier V6A. Output of V6A drives the audio amplifier V6B.

The clipper level control R57 is a small screwdriver adjust potentiometer mounted on the power supply chassis near the front panel just to the right of the speaker.

(a) Install a dummy load in the Antenna connector
(b) Turn the MIC GAIN control fully clockwise and then counterclockwise about 1/8th of a turn.
(c) Turn clipper level control fully clockwise and key microphone. Talk closely into microphone at normal voice level and slowly turn clipper level control counterclockwise until TRANSMIT INDICATOR lamp flickers on voice peaks only.





NOTE

Voltage

Resistance

T - TRANSMIT

R - RECEIVE

VOLTAGE MEASUREMENTS, NO SIGNAL

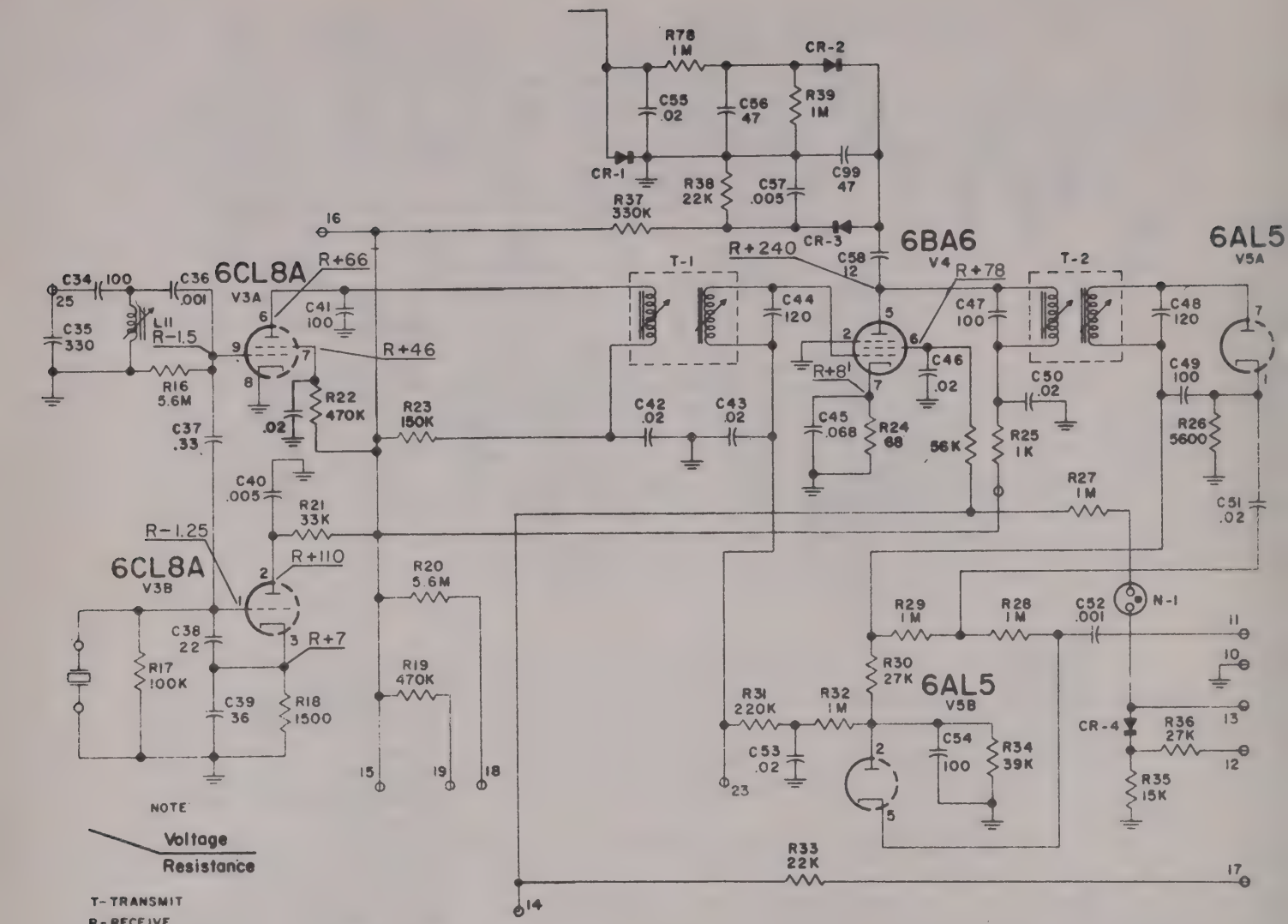
115V OPERATION

VOLTAGES WILL VARY FROM 6 TO 12 TO 115 VOLT OPERATION

VOLTAGE MEASUREMENTS MADE WITH VTVM

ALL READINGS ± 10%

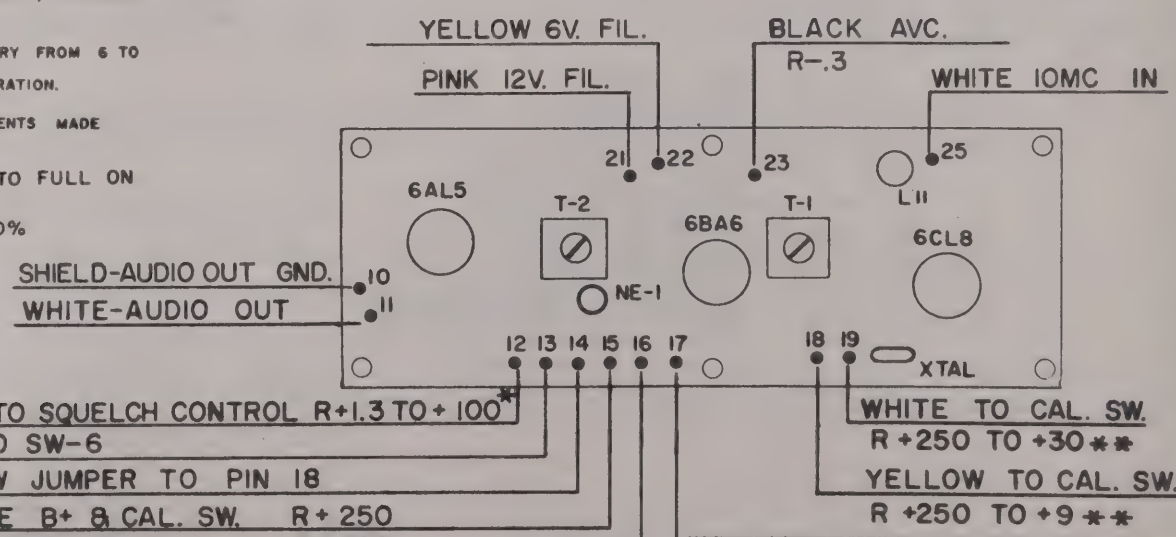
CONVERTER UNIT MODEL 100 D		
DRAWN BY- JS	CHECKED BY- CRL	APPROVED BY
DATE- 4-22-63	DATE- 5-2-63	— —
INTERNATIONAL CRYSTAL MFG. CO., INC. 18 N. LEE, OKLAHOMA CITY, OKLAHOMA		



NOTE

Voltage
Resistance

T-TRANSMIT
R-RECEIVE
VOLTAGE MEASUREMENTS, NO SIGNAL
115 V OPERATION.
VOLTAGES WILL VARY FROM 6 TO
12 TO 115 VOLT OPERATION.
VOLTAGE MEASUREMENTS MADE
WITH VTVM
*SQUELCH OFF TO FULL ON
**CALIBRATE ON
ALL READINGS ±10%



I.F. UNIT MODEL 100D		
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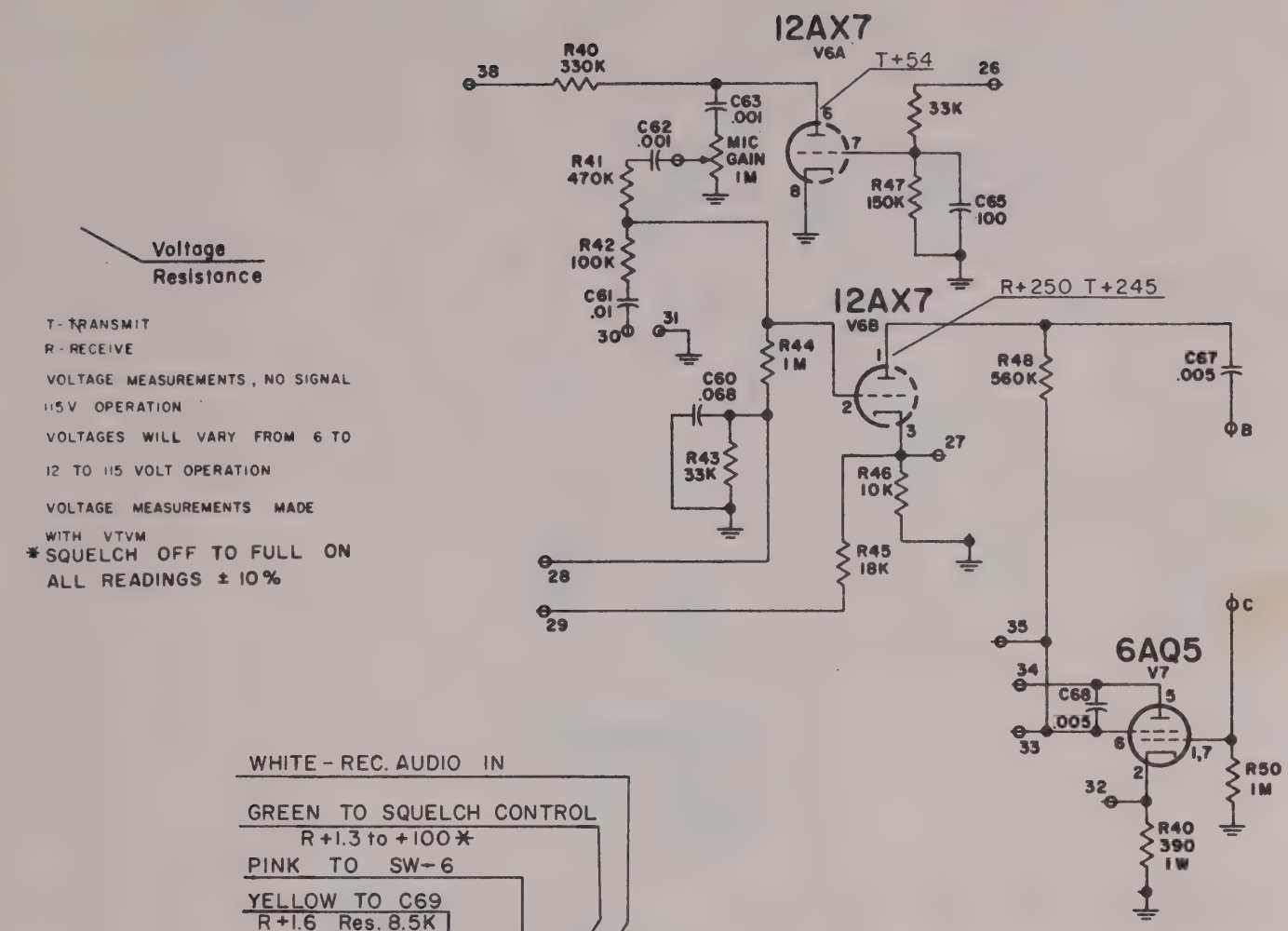
18 N. LEE, OKLAHOMA CITY, OKLAHOMA



AUDIO UNIT MODEL 100 D		
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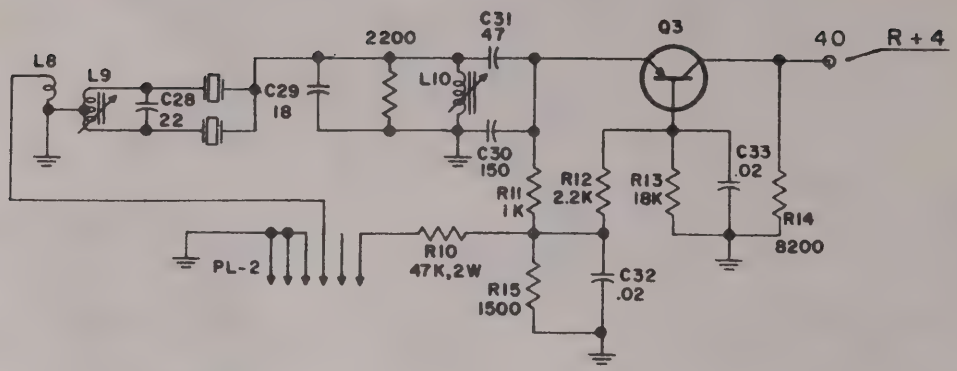
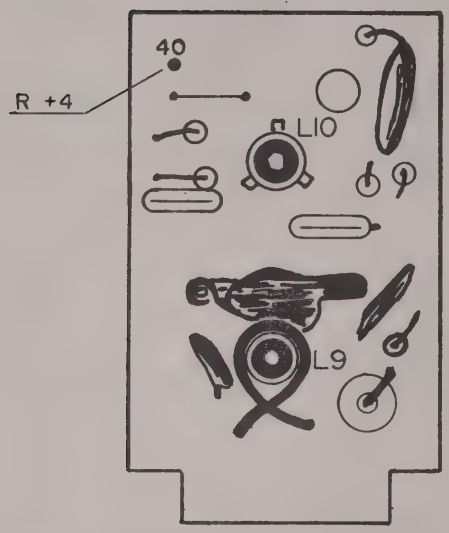
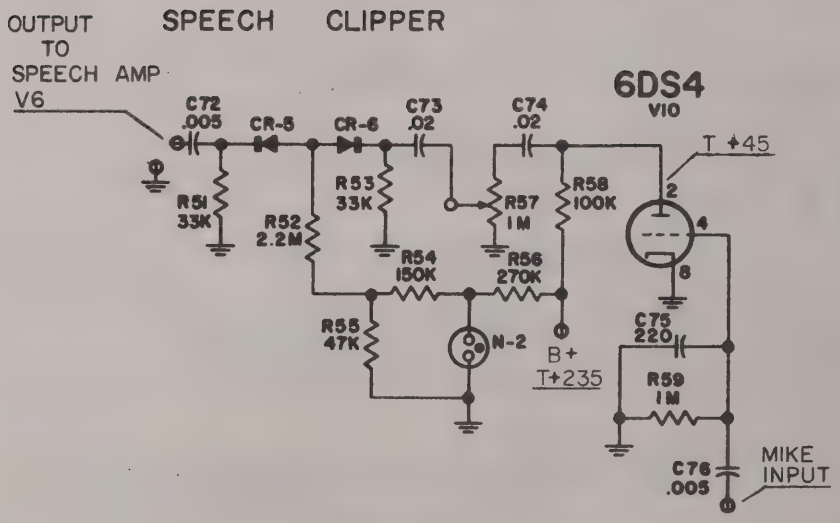
DATE- 5-2-63	DATE- 5-6-63	— —
INTERNATIONAL CRYSTAL MFG. CO., INC. 18 N. LEE, OKLAHOMA CITY, OKLAHOMA		

CRYSTAL FILTER





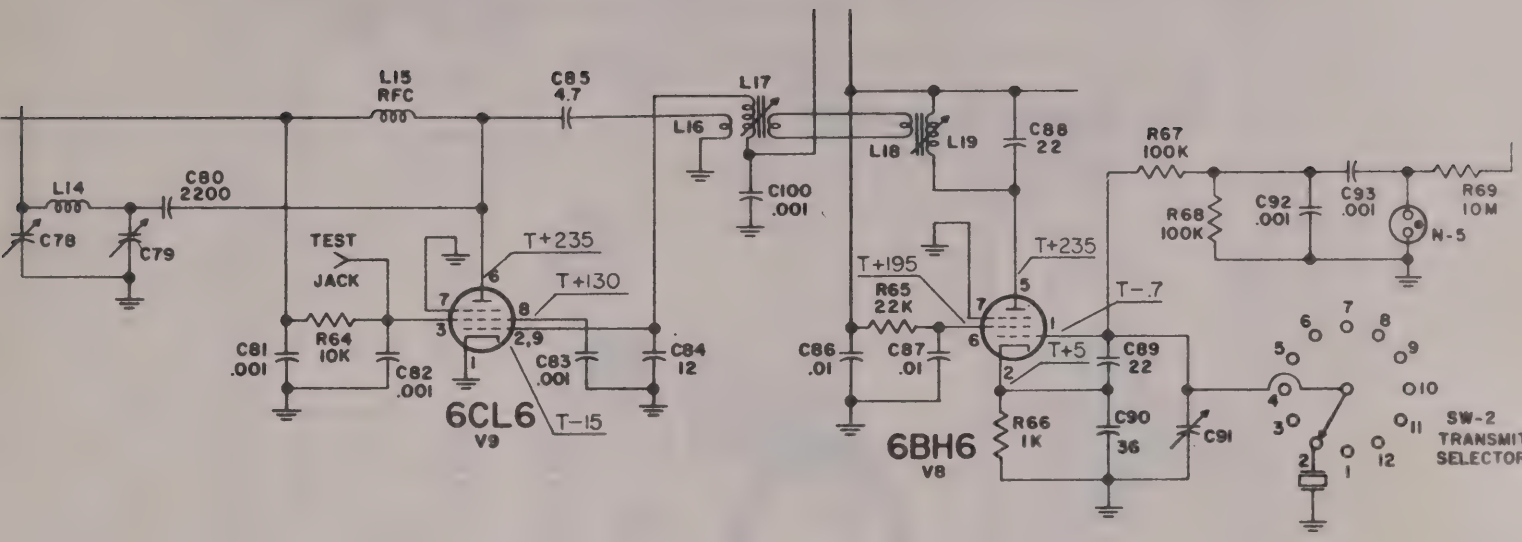
SPEECH CLIPPER



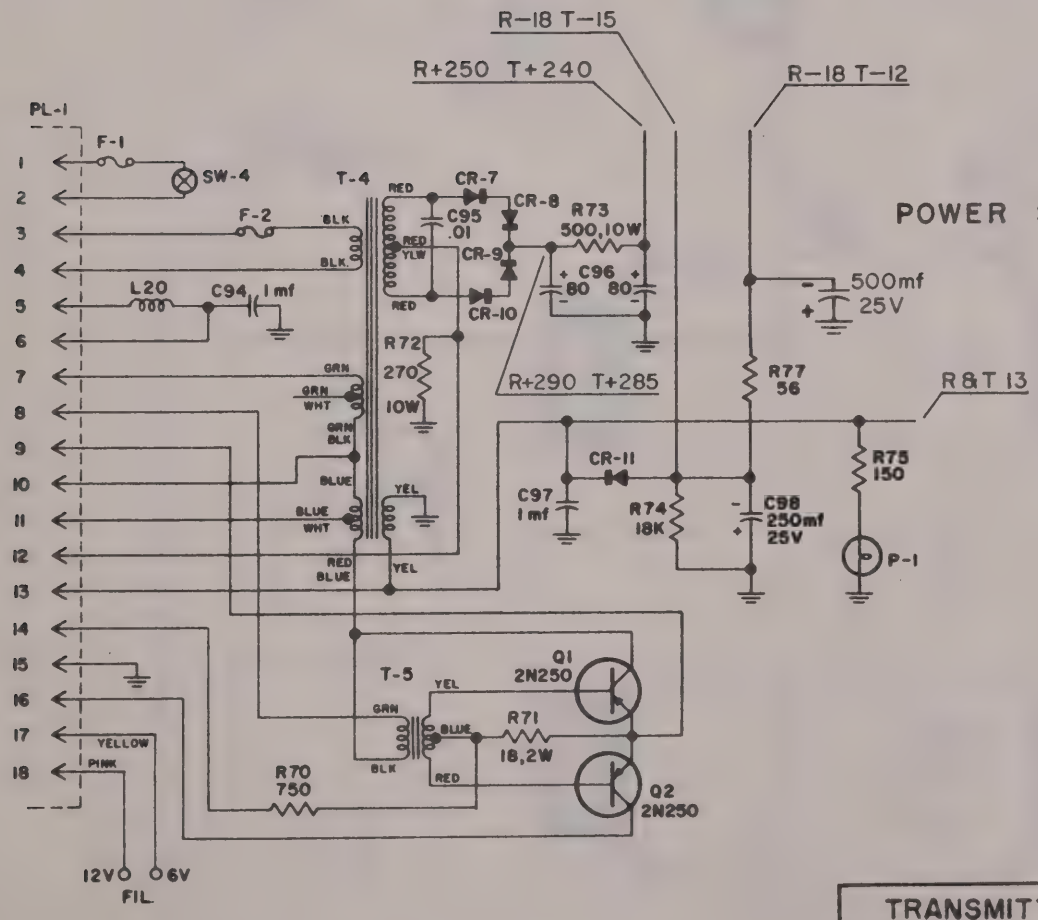
CRYSTAL FILTER & SPEECH CLIPPER STAGES		
DRAWN BY—HB DATE—5-3-63	CHECKED BY—RP DATE—5-6-63	APPROVED BY — —

INTERNATIONAL CRYSTAL MFG. CO., INC.
18 N. LEE, OKLAHOMA CITY, OKLAHOMA

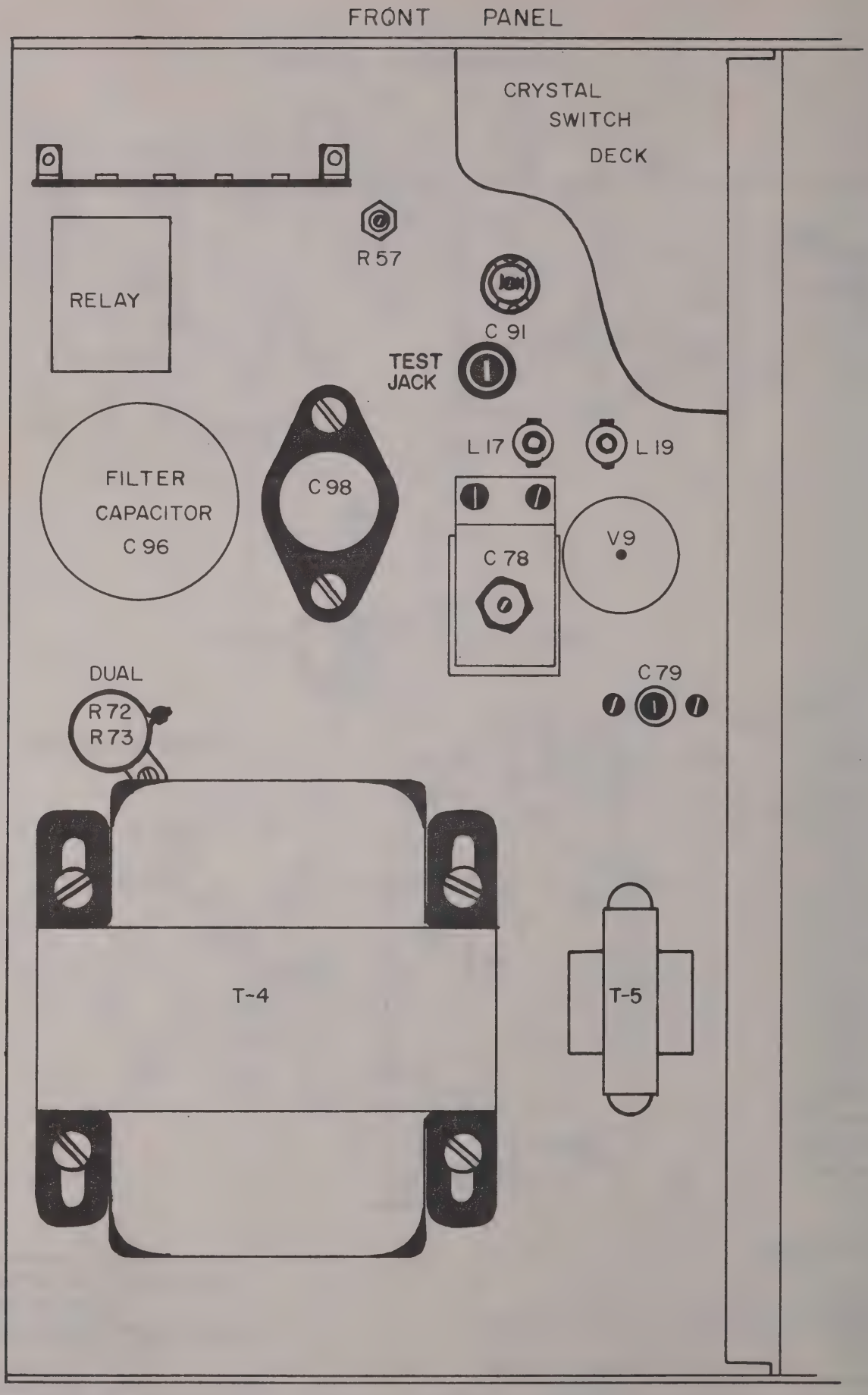
TRANSMITTER SECTION

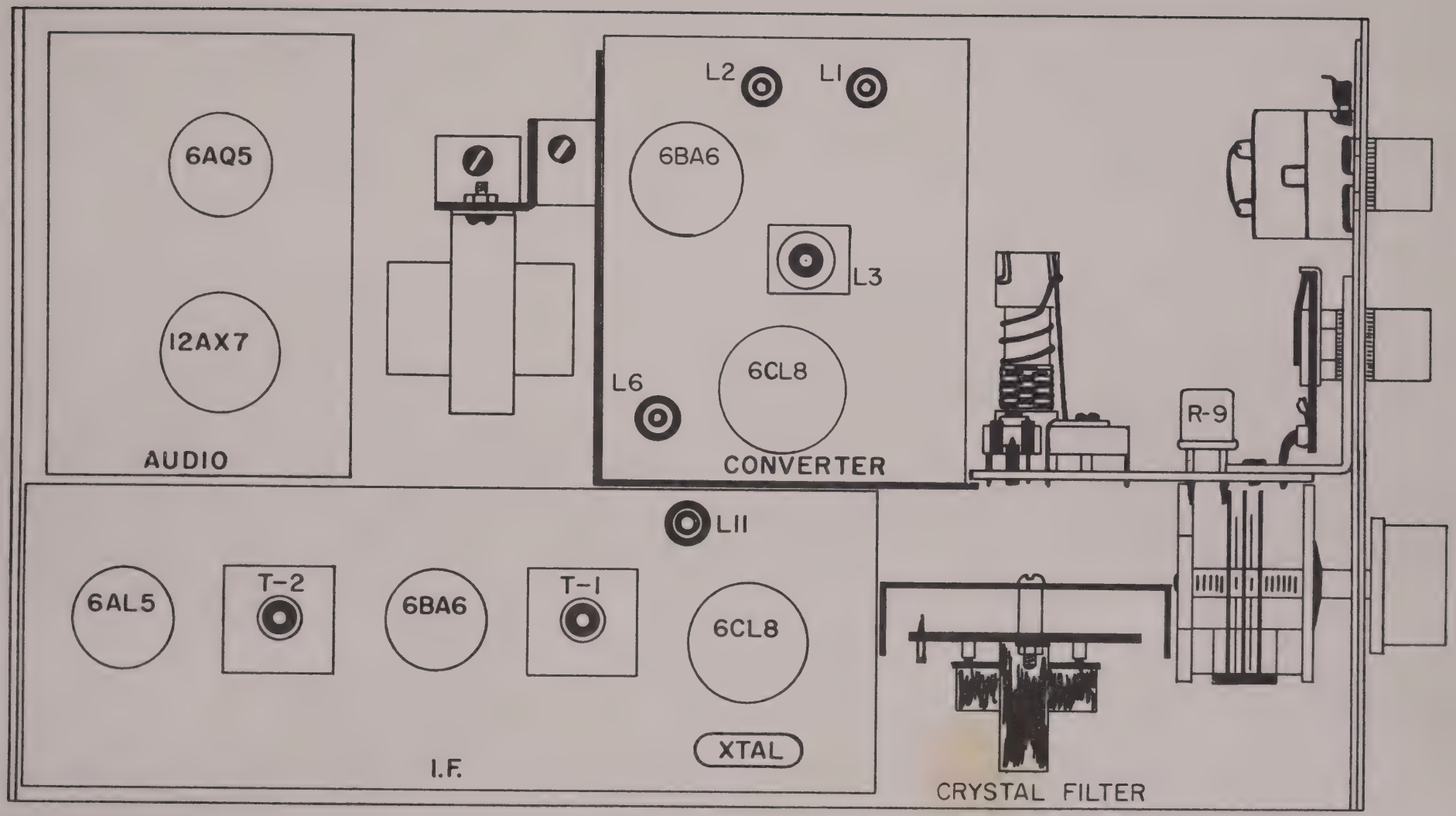


POWER SUPPLY SECTION

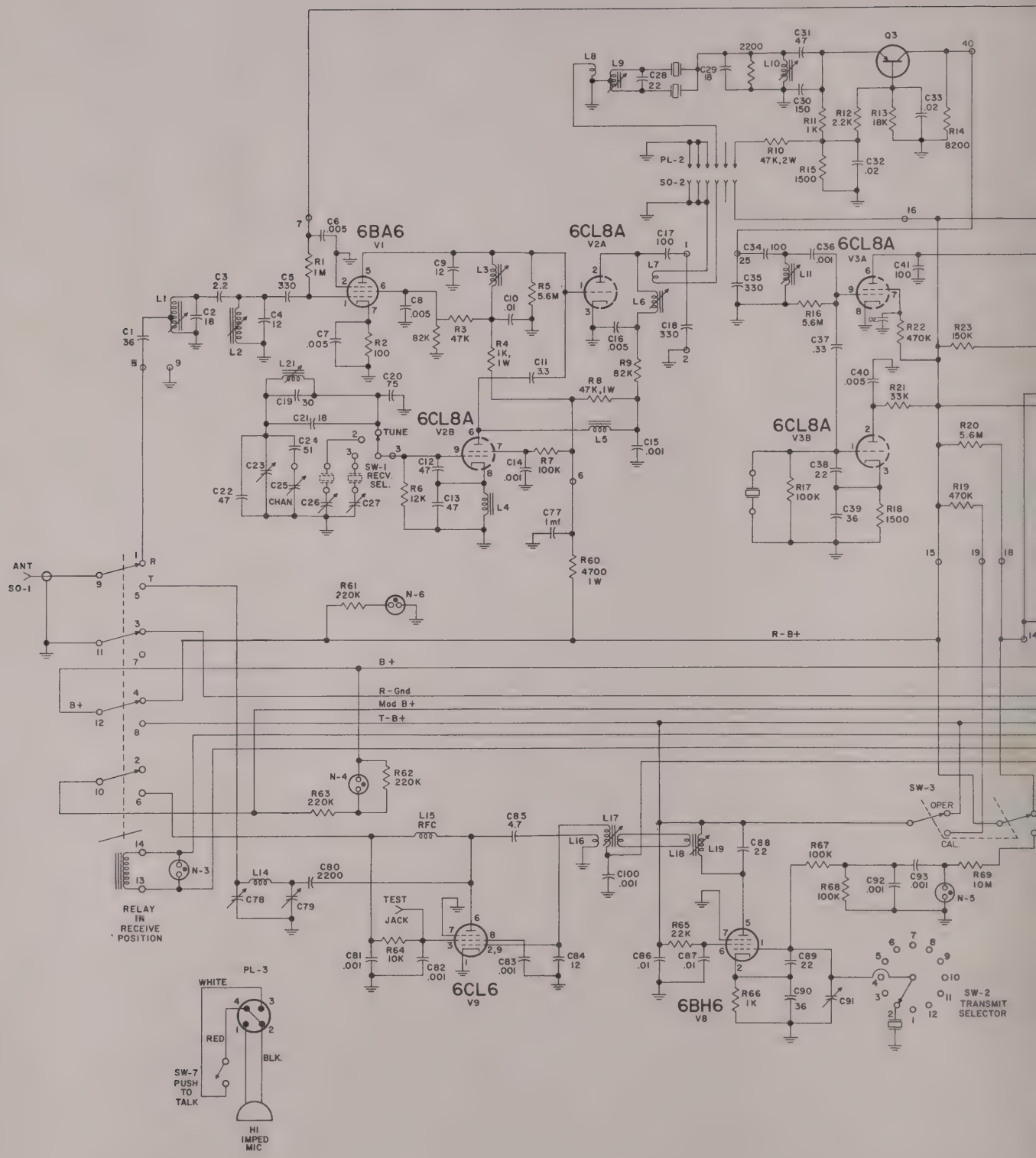


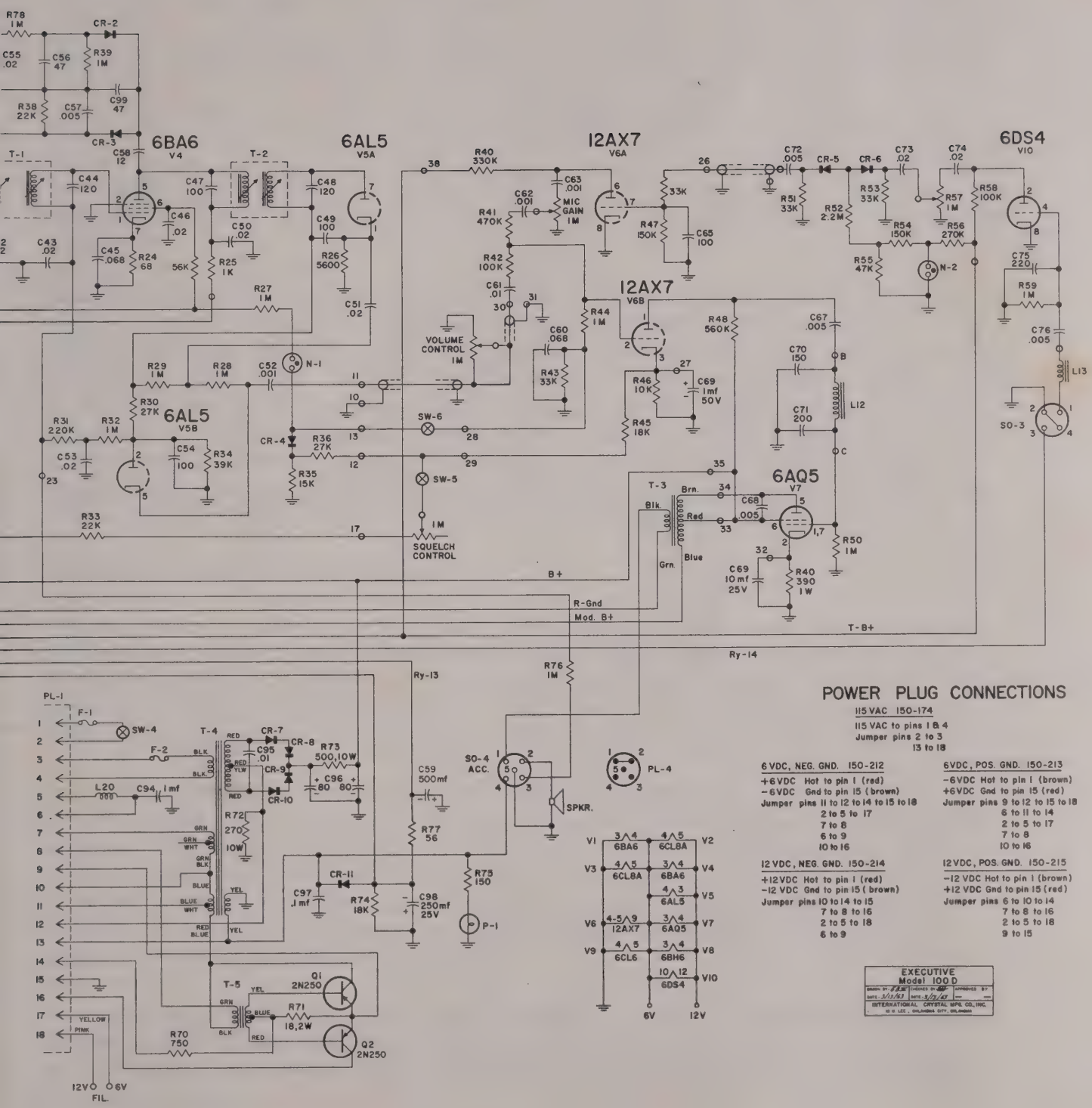
TRANSMITTER & POWER SUPPLY MODEL 100 D		
DRAWN BY—	CHECKED BY—	APPROVED BY
DATE- 5-1-63	DATE- 5-2-63	— —
INTERNATIONAL CRYSTAL MFG. CO., INC. 18 N. LEE, OKLAHOMA CITY, OKLAHOMA		


FRONT PANEL
CRYSTAL
SWITCH
DECK
R 57
RELAY
C 91
TEST
JACK
L 17
L 19
FILTER
CAPACITOR
C 96
C 98
C 78
V9
C 79
DUAL
R 72
R 73
T-4
T-5
TOP VIEW



RECEIVER SECTION


6BA6
V1
6CL8A
V2A
6CL8A
V3A
6CL8A
V2B
6CL8A
V3B
6CL6
V9
6BH6
V8
Q3
L1
L2
L3
L4
L5
L6
L7
L8
L9
L10
L11
L14
L15 RFC
L16
L17
L18
L19
L21
TUNE
CHAN
SW-1 RECV. SEL.
SW-2 TRANSMIT SELECTOR
SW-3
OPER
CAL
SW-7 PUSH TO TALK
TEST JACK
PL-2
PL-3
SO-2
SO-1
ANT
N-3
N-4
N-5
N-6
RELAY IN RECEIVE POSITION
WHITE
RED
BLK.
HI IMPED MIC
R-B+
B+
R-Gnd
Mod B+
T-B+



POWER PLUG CONNECTIONS

115 VAC 150-174

115 VAC to pins 1 & 4
Jumper pins 2 to 3
13 to 18

6 VDC, NEG. GND. 150-212

+6 VDC Hot to pin 1 (red)
−6 VDC Gnd to pin 15 (brown)
Jumper pins 11 to 12 to 14 to 15 to 18
2 to 5 to 17
7 to 8
6 to 9
10 to 16

6 VDC, POS. GND. 150-213

−6 VDC Hot to pin 1 (brown)
+6 VDC Gnd to pin 15 (red)
Jumper pins 9 to 12 to 15 to 18
6 to 11 to 14
2 to 5 to 17
7 to 8
10 to 16

12 VDC, NEG. GND. 150-214

+12 VDC Hot to pin 1 (red)
−12 VDC Gnd to pin 15 (brown)
Jumper pins 10 to 14 to 15
7 to 8 to 16
2 to 5 to 18
6 to 9

12 VDC, POS. GND. 150-215

−12 VDC Hot to pin 1 (brown)
+12 VDC Gnd to pin 15 (red)
Jumper pins 6 to 10 to 14
7 to 8 to 16
2 to 5 to 18
9 to 15

EXECUTIVE
Model 100 D
INTERNATIONAL CRYSTAL MFG. CO., INC.

WARRANTY REGISTRATION

Model_____ Date Purchased_____ Serial No._____

Purchased from_____

Owner's Name_____

Owner's Address_____

City_____ State_____

Owner's Call_____

10-153

WARRANTY

International Crystal Manufacturing Company warrants the parts and tubes in any International Citizen Transceiver to be free from defects in workmanship and material arising from normal usage. Its obligation under this warranty is limited to replacing any such parts or tubes of the receiver which, after regular installation and under normal usage and service, shall be returned within ninety (90) days from the date of original purchase of the set to the authorized dealer from whom the purchase was made and which shall be found to have been thus defective in accordance with the policies established by International Crystal Manufacturing Company.

The obligation of International Crystal Manufacturing Company is limited to making replacement parts available to the purchaser, and does not include either the making or the furnishing of any labor in connection with the installation of such replacement parts nor does it include responsibility for any transportation expense.

International Crystal Manufacturing Company assumes no liability and shall not be liable in any respect for failure to perform or delay in performing its obligations with respect to the above warranty if such failure or delay results, directly or indirectly, from any preference, priority or allocation order issued by the Government or because of any other act of the Government, or by war, conditions of war, inadequate transportation facilities, conditions of weather, acts of God, strikes, lockouts, Governmental controls, or Internationals reasonable requirements for manufacturing purposes, or any cause beyond its control or occurring without its fault, whether the same kind or not.

CONDITIONS AND EXCLUSIONS

This warranty is expressly in lieu of all other agreements and warranties expressed or implied, and International Crystal does not authorize any person to assume for it the obligations contained in this warranty and neither assumes nor authorized any representative or other person to assume for it any other liability in connection with such International units or parts or tubes thereof.

The warranty herein extends only to the original consumer purchaser and is not assignable or transferable and shall not apply to any transceiver or parts or tubes thereof which have been repaired or replaced by anyone else other than an authorized International dealer, service contractor or distributor, or which have been subject to alteration, misuse, negligence or accident, or to the parts or tubes of any receiver which have had the serial number or name altered, defaced or removed.

International Crystal Manufacturing Company is under no obligation to extend this warranty to any unit for which an International registration card has not been completed and mailed to the Company within fifteen (15) days after date of purchase.

FEDERAL COMMUNICATIONS COMMISSION
Washington 25, D.C.

87048
April 15, 1960

UNAUTHORIZED PRACTICES IN BUSINESS AND CITIZENS RADIO SERVICES

An increasing number of reports have reached the Commission concerning the practice of some suppliers of Business and Citizens Radio Services equipment to advise their customers that such equipment may be operated by them prior to the issuance of a radio station license by the Commission. In some instances, sellers have"assigned" radio station call signs to purchasers in conjunction with the sale of radio apparatus and, in a few such cases, these call signs have been identical with those authorized to be used by the manufacturer or seller of the equipment.

A radio station license is required for the use or operation of a radio station in the Business and Citizens Radio Services by Section 301 of the Communications Act. With the exception of certain low power equipment described in Part 15 of the Commission's Rules, the operation of any radio transmission apparatus by a person other than the one to whom the Commission has issued a radio station license is illegal and may result in the imposition of severe criminal sanctions (one year in prison or $10,000 fine, or both) or in the institution of other enforcement action by the Commission.

Under Section 310 (b) of the Communications Act, the prior consent of the Commission is required for the transfer or assignment of any radio station license or the rights granted thereunder. One who fails to observe this provision by the purported transfer of his operating authority subjects himself to possible license revocation and such other enforcement action as the Commission may consider warranted by the circumstances. The denomination of such unlawful activities as "equipment demonstrations" does not render them less illicit.

This matter is being brought to the attention of manufacturers, distributors and retail vendors of Business and Citizens Radio Service communication equipment in the belief that they share the Commission's conviction that the orderly development of these dynamic special radio services is hampered by the above-described practices and that one who engages in such practices, in addition to the possibility of having drastic enforcement action instituted against him, may be sacrificing for the benefit of an immediate sale the long range good will of a misadvised customer.

It is requested that the foregoing be brought to the attention of the personnel in all organizations concerned in any way with the sale, maintenance or use of Business or Citizens Radio Stations in order that a prompt cessation of unlicensed operation of radio stations in these services may be brought about.

-FCC-

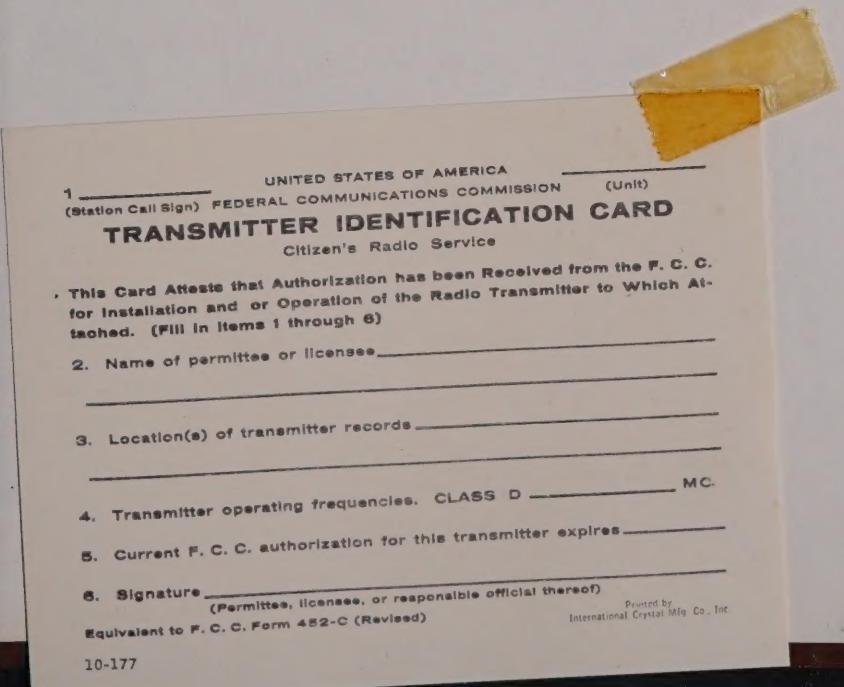
F.C.C. RULES & REGULATIONS

PART 19.72 POSTING OF STATION LICENSE

(b) The current authorization of each citizens radio station operated as a mobile station or operated at temporary locations may be retained in the permanent records of the station and need not be posted; However, an executed Transmitter Identification Card (FCC Form 452-C, Revised) shall be affixed to each transmitter which is operated as a mobile station or is operated at temporary locations, and to the control equipment of each such transmitter in every case where such transmitter is not in view from the location from which the station in controlled.

(c) The following information shall be entered on each Transmitter Identification Card (FCC Form 452-C, Revised) which is used for transmitter or station identification in accordance with the foregoing:

(1) Name of the station licensee;
(2) Station call sign assigned by the Commission (see 19.62);
(3) Exact location or locations of the permanent station records;
(4) Frequency or frequencies upon which the assoicated transmitter is adjusted to operate; and
(5) Signature of the licensee.



1 _____ UNITED STATES OF AMERICA _____
(Station Call Sign) FEDERAL COMMUNICATIONS COMMISSION (Unit)

TRANSMITTER IDENTIFICATION CARD

Citizen's Radio Service

This Card Attests that Authorization has been Received from the F. C. C. for Installation and or Operation of the Radio Transmitter to Which Attached. (Fill in Items 1 through 6)

2. Name of permittee or licensee _____

3. Location(s) of transmitter records _____

4. Transmitter operating frequencies. CLASS D _____ MC.

5. Current F. C. C. authorization for this transmitter expires _____

6. Signature _____
(Permittee, licensee, or responsible official thereof)

Equivalent to F. C. C. Form 452-C (Revised)

Printed by International Crystal Mfg. Co., Inc.

10-177